

*The*

SEPTEMBER 1942

# TOOL ENGINEER

MACHINERY

• PRODUCTION •

TOOLS



**THE NEW BRITAIN MACHINE COMPANY** has been honored

BY RECEIVING

**THE ARMY-NAVY PRODUCTION AWARD**

CONFERRED FOR HIGH ACHIEVEMENT IN THE PRODUCTION OF WAR EQUIPMENT

THIS AWARD WILL SPUR US ALL TO GREATER EFFORT

**THE NEW BRITAIN MACHINE COMPANY**

NEW BRITAIN, CONN.

*Official Publication of the American Society of Tool Engineers*

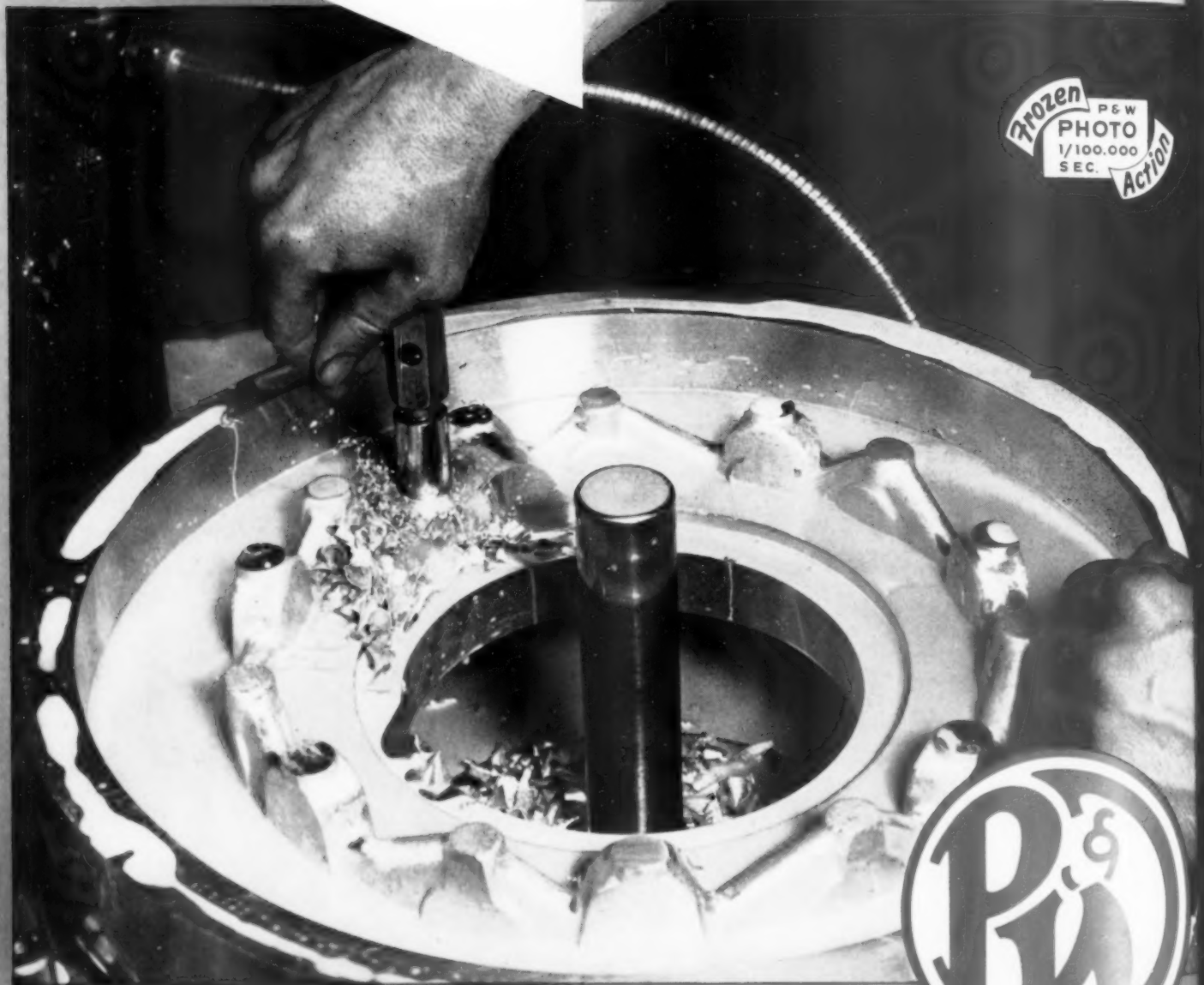
# HERE'S ONE REASON why one Yankee pilot is "worth a dozen Japs"

THE big ring is an American aircraft engine in embryo. The hands are doing a routine, high-speed inspection job — plug-gaging a hole. That's precision in the making . . . accuracy to .00010" coming up . . . one reason why American pilots will soon rule the skies of all the world.

That's a Pratt & Whitney plug gage . . . no laboratory toy, but a calloused, hard-working production tool that does its job and comes up smiling. Heat-treated for enduring service, finished for uncanny accuracy, it's typical of P&W precision products now building America's strength for Victory.

There's one catch: as things stand now, there are a "dozen Japs," more or less, for every well-equipped Yankee in the battle zone. So don't spare the pressure . . . keep 'em rolling. Your P&W tools can take it.

P&W Photo—Unretouched



Frozen  
PEW  
PHOTO  
1/100,000  
SEC.  
Action



## PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT



 **STANDARD**  
*Dial Snap Gages*

"CONVOY  
YOUR PARTS  
THRU  
42  
PRODUCTION"

STANDARD GAGE CO., INC.  
DOUGHERTIE, NEW YORK

# HOLO-KROME



COMPLETELY COLD FORGED FROM SOLID STOCK

## *fibro forged*

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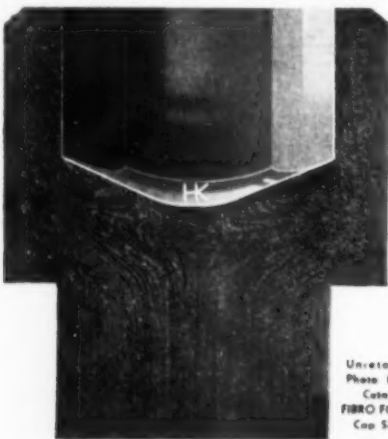
THE RESULTS OF A SUPERIOR METHOD PATENTED BY HOLO-KROME

## SOCKET SCREWS

*GUARANTEED*  
*Unfailing PERFORMANCE*

HOLO-KROME SOCKET SCREW STANDARDS AVAILABLE

PRECISION MADE FOR EXACTING USES



Unretouched  
Photo Etched  
Cutaway  
FIBRO FORGED  
Cap Screw

THE HOLO-KROME SCREW CORP.

HARTFORD, CONN., U. S. A.

# THE TOOL ENGINEER

Volume XI

SEPTEMBER, 1942

Number 9

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**A**NOTHER "biggest" comes from the West Coast. On page 109, *The Tool Engineer* tells how a showcase manufacturer constructed for his own use what may be the world's largest deep draw press. This company is mass producing for war, thousands of ship ventilators—stamping, welding and finishing with methods that are a tribute to Los Angeles Tool Engineers.

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National Business Papers Assn.

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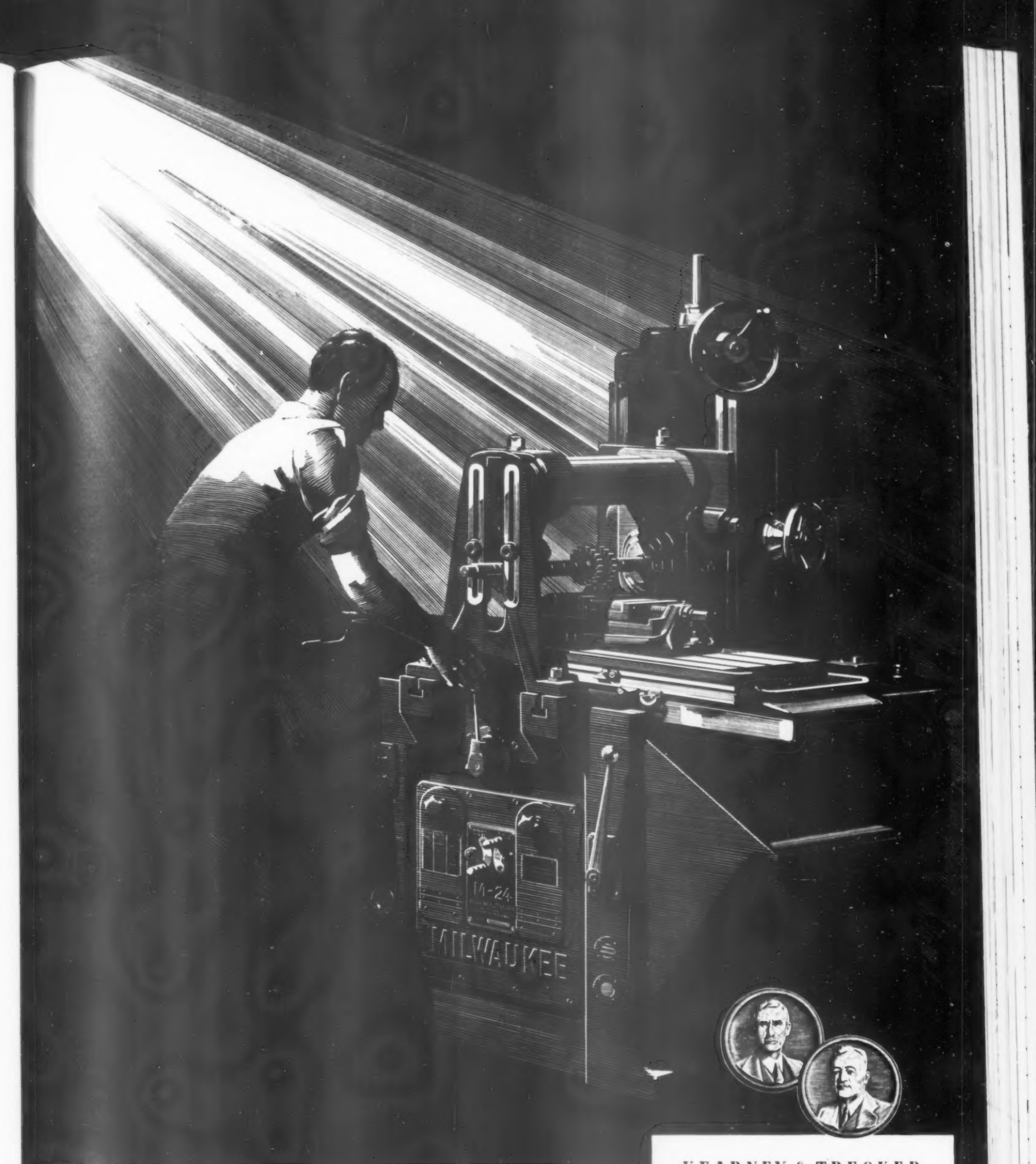
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*Simplex Milwaukee Milling Machine—a compact, medium size machine for efficient production of smaller parts.*

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CORPORATION

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**M A C H I N E T O O L S**

# DIVING SPEEDS require *Extra Safety*



... as with

## MICROHONING

When diving motors "rev" up to 5600 r.p.m., the entire success of a mission may depend upon having an extra margin of safety in critical bearing surfaces. These surfaces are not completely safe unless extremely accurate, and "structurally perfect"—entirely free of microscopic cracks and disturbed subsurface material which induce fatigue failure.

**MICROFINISH HONING** is providing such surface quality in regular high production because—

It does not generate injurious frictional heat—hence avoids cracks.

It does not disturb or weaken subsurface material.

It corrects error and generates accuracy.

It generates any desired type or degree of controlled surface finish smoothness.

It provides all these advantages under the control of a single process.

Write for Bulletin A. R. 67

*Micromatic*

**HONE CORPORATION**

DETROIT, MICHIGAN

Manufacturers of Honing Machine Tools



## MICROHONING is used to finish

Gun Barrels—before and after rifling—diameters .303" to 18" and lengths up to 75 feet • Gun Recuperators and Engine Cylinders • Wrist Pins • Valve Guides • Con Rods • Bearings • Pneumatic and Hydraulic Cylinders—and many other precision parts for ordnance, aircraft, automotive equipment, tanks, machine tools, etc.



**MICROHONING** is now used to generate  
finished surfaces in many  
parts—in bores, on  
shafts, pins, etc.

SAVE TIME  
SAVE METAL  
SAVE COST  
IMPROVE  
QUALITY

**ENGINES** • Honing Valve Guides after assembly in crankcase (Radial Aircraft Engine) on double-end Hydrohoner with Microsize Control. Production—3 to 6 complete assemblies per hour—removes average of .0005" to .001"—generates uniform size within .0003" to .0005", accuracy within .0001" to .0003", and surface finish within 3 to 5 microinches r.m.s.

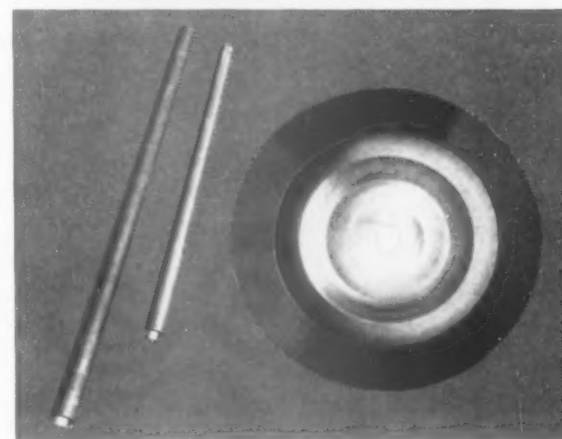
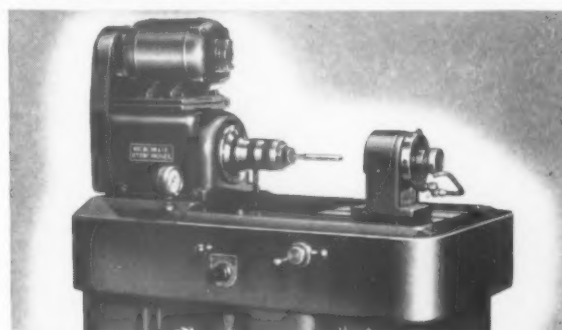
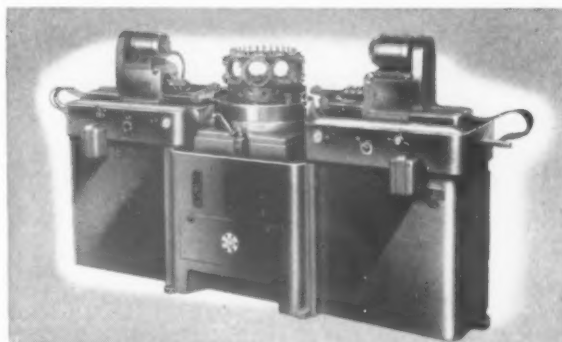


**HYDRAULICS** • Honing O.D. of pistons for a variable delivery hydraulic pump—with the unusual feature that half the piston surface area is hardened, half is soft.

**ORDNANCE** • Typical gun barrels regularly honed in production include 50-caliber machine guns—20-millimeter cannon as well as other and larger calibers up to and including 16" and 18", and from 30 inches to 75 feet in length.

External honing of recoil piston rods generates accuracy within .0001" to .0003" and any desirable finish.

Internal honing of recoil cylinders generates round and straight accuracy within .0005" to .0007"—and the exceptional "co-directional" draw-finish demanded by such service.





**GRADE**

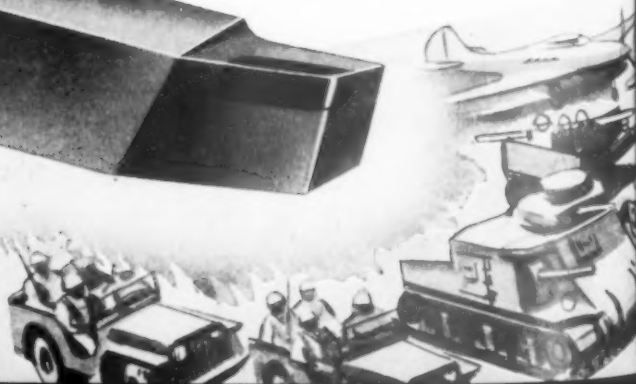
**TA**

**TUNGSTEN-TITANIUM\***  
**CARBIDE**

**ORDNANCE MAKERS USE  
FIRTHITE GRADE TA:**

- ★ For higher cutting speeds and greater production;
- ★ For sustained accuracy and smoother finish on work;
- ★ For cutting hardened alloy steels . . . for tanks, aircraft, warships, small arms and cannon, shells, bombs, etc.;
- ★ For wide adaptability. Firthite Grade TA can be used for nearly all steel turning except the very heavy (slow) or the light (exceptionally speedy) cuts. Firthite TA machines both ferrous and non-ferrous materials, such as aluminum;
- ★ For remarkable wear resistance;
- ★ For strength and toughness to resist light, intermittent cuts.

\* Firthite Grade TA utilizes three North American raw materials constantly available.



FIRTHITE

# AMERICA'S VICTORY WEAPON ON THE PRODUCTION FRONT

FIRTHITE Grade TA was developed to outperform any other cutting material used for machining steels under "average" conditions.

FIRTHITE Grade TA's sensational, dependable performance is due to the special composition: Tungsten, Cobalt, and Titanium—all three obtainable in ample quantities to fill wartime needs.

TITANIUM—the "wonder" ingredient in Firthite Grade TA Sintered Carbide—confers these important advantages:

**TITANIUM enables the Firthite TA user to do a better, faster job of steel cutting;**

**TITANIUM gives the Firthite TA user a tool at a**

**price comparable to that of high-speed steel, plus much greater productivity for the money.**

**TITANIUM assures the Firthite TA user of a reliable supply, since TITANIUM is one of the commonest metals—no possibility of shortage.**

**TUNGSTEN**—essential in all sintered carbides—is available in large amounts for making all grades of FIRTHITE. (Firth-Sterling Steel Company owns the Wolf Tongue Mining Company—producers of tungsten in the United States.)

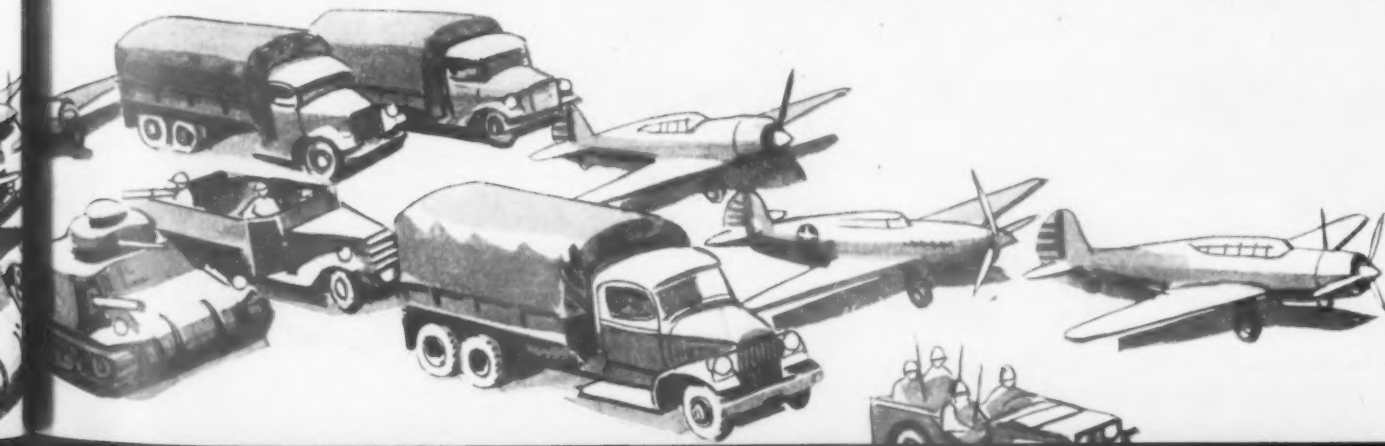
★ ★ ★ ★ ★ ★ ★ ★ ★ ★

In addition to Grade TA, Firthite is made in many other grades for speedy machining of steel, cast iron, non-ferrous metals, and non-metallic compositions.

TOOL STEELS AND  
CARBIDES FOR COMPLETE  
SHOP TOOLING

## ***Firth-Sterling*** **STEEL COMPANY**

OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA DAYTON DETROIT





## ***DIESEL POWER —the Heart Throb of a Young Giant***

It sends the ship of war  
on its grim errand—  
it speeds the streamliner  
on its swift mission across a continent—  
it supplies the muscle and sinew  
for truck, tractor and tank—  
it is the smooth flow of energy  
that turns the wheels of thousands  
of manufacturing and utility plants.

Gairing standard, special and Gair-Lock  
Inserted Blade cutting tools

are playing an important part in  
the volume production of Diesel units.

They are widely used for roughing,  
semi-finishing and finishing operations  
on connecting rods, cylinder liners,  
blower housings, housing end plates  
and pump bodies.

This is just one front  
in the war of production  
on which Gairing tools are in action.

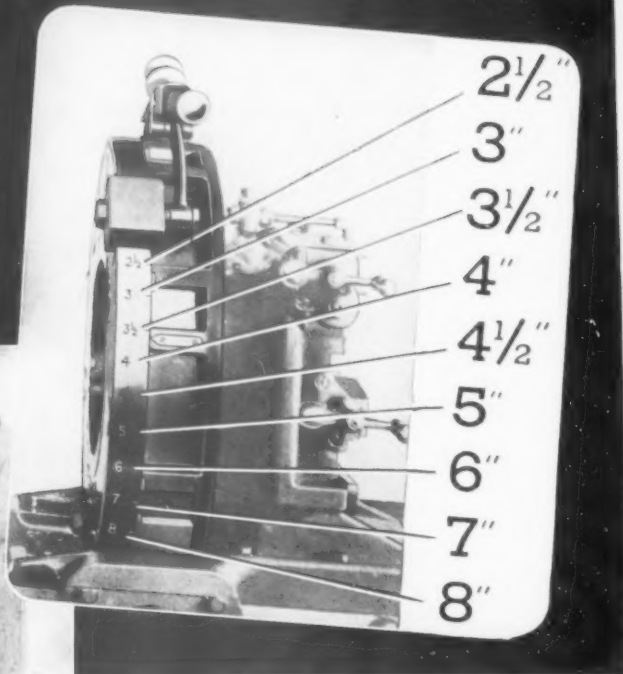
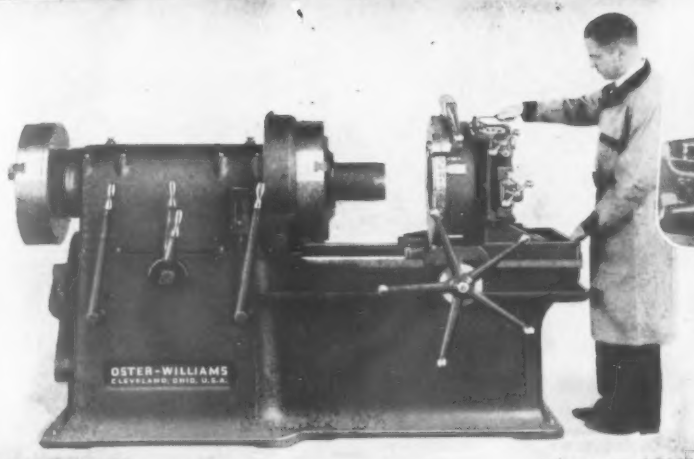
**THE GAIRING TOOL COMPANY**  
Detroit, Michigan



*Gairing swing tool cutter head (right)  
operating in a horizontal  
boring machine (above).  
It roughs, semi-finishes and finish-bores  
Diesel engine cylinder liners.*

**GAIRING**  
FOR A  
QUARTER CENTURY  
SPECIALISTS  
IN FINE  
CUTTING TOOLS

# THE *Answer* TO CONTINUOUS, HIGH SPEED ACCURATE PIPE THREADING



A single die-head handles all sizes within range of machine. Movement of cam lever sets chasers for any size. Micrometer adjustment assures extreme accuracy in setting chasers for any depth of thread desired.

## NOTE THESE SPEEDS!

Seconds required to cut full American National Standard pipe thread at recommended speed are indicated below. Pipe made of tougher material than standard should be run at slower speeds. Higher speeds may be used for finer pitches, smaller tapers and brass; and for cutting off.

No. 4 "Rapiduction"	
Pipe Size	Seconds
1"	10.5
1 1/4"	10.7
1 1/2"	15.4
2"	16.1
2 1/2"	22.0
3"	32.2
3 1/2"	33.3
4"	49.0

No. 8 "Rapiduction"	
Pipe Size	Seconds
2 1/2"	20.1
3"	29.8
3 1/2"	30.8
4"	41.7
5"	44.4
6"	66.0
7"	80.0
8"	103.0

No. 6-A "Rapiduction"	
Pipe Size	Seconds
1 1/2"	11.3
2"	16.5
2 1/2"	24.3
3"	25.3
3 1/2"	33.4
4"	34.9
5"	52.6
6"	80.0

No. 12 "Rapiduction"	
Pipe Size	Seconds
3 1/2"	31.8
4"	46.6
5"	49.6
6"	64.3
7"	74.5
8"	86.7
10"	132.0
12"	190.0

# OSTER

## *Speeds up* PIPE THREADING

## OSTER "RAPIDUCTION"

### Power Pipe Threading Machines

Do you need pipe threading speed? Get a "RAPIDUCTION"! But you must be assured of accuracy? Get a "RAPIDUCTION"!

What about sizes? "RAPIDUCTION" is made in four sizes. (See table at left.) What about special work requiring extreme accuracy? A lead screw attachment is available for pitches 8, 10, 11 or 11 1/2 and 14; is extra equipment on machines, 4, 6-A and 8; standard equipment on machine No. 12. Also available (as extra equipment) is a taper attachment for A. P. I. Standard and other threads of longer than Briggs Standard Length.

But what are the FEATURES of these "RAPIDUCTION" machines? Too many to enumerate here. Why not fill in the form below, tear out, mail to us, Now?

### THE OSTER MFG. COMPANY

2063 East 61st St. • Cleveland, Ohio, U. S. A.

Rush, by return mail, complete information about "RAPIDUCTION" Power Pipe Threading Machines.

Name .....

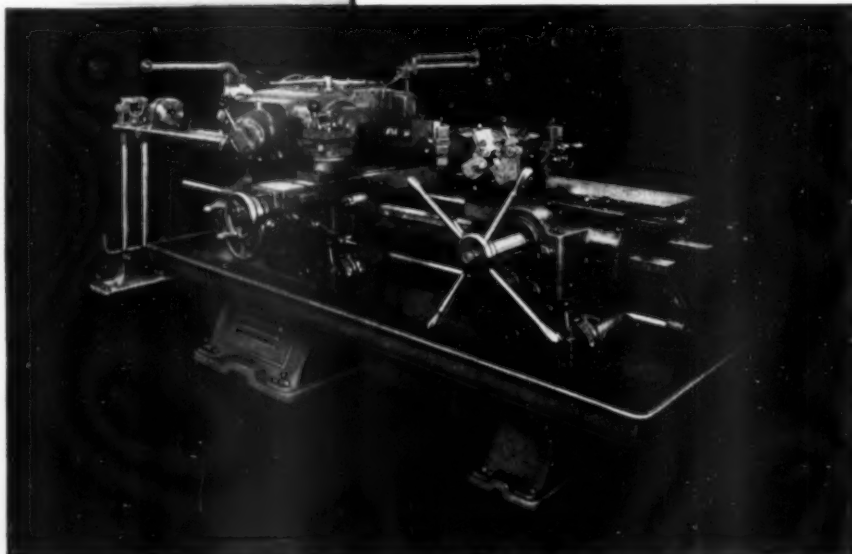
Address .....

City ..... State .....

# Mr. Howe was ahead of



*Who* invented the turret lathe? This still seems to be an open question. Prior to 1850 its principles were understood but had been used only in occasional special machines built by manufacturers for their own shops. Frederick W. Howe brought the turret lathe idea to Vermont in 1847. There Howe, Lawrence, Stone and Alvord built the first turret lathe for general sale. This pioneer model was built in the shop from which Jones & Lamson Machine Company is a direct successor.



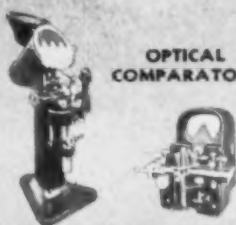
No. 3 Jones & Lamson Ram Type Universal Turret Lathe with standard bar equipment.

## JONES

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS



RAM TYPE UNIVERSAL TURRET LATHE



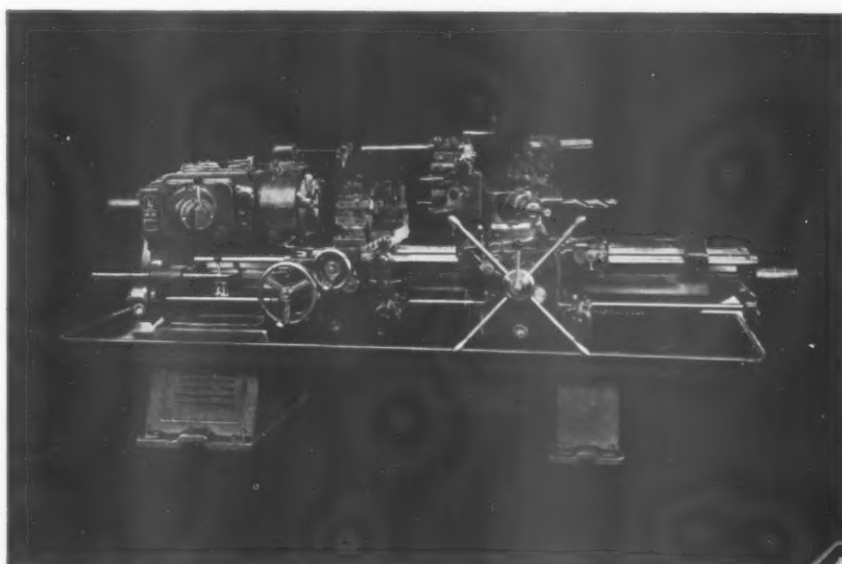
# his time - and so are you !

**F**REDERICK W. HOWE was ahead of his time, and so are you, when your plant is equipped with modern Jones & Lamson Turret Lathes.

Modern Jones & Lamson Turret Lathes are ahead of the times in many ways. Into these new machines have been built ample reserves of speed, rigidity and useful power to enable

you to take full advantage of every improvement in hard alloy cutting tools — available today or liable to become available in the immediate future.

Thus Jones & Lamson Turret Lathes can help you meet the urgent demands of immediate wartime production and still be available to help you in the hard years that lie ahead.



7A Jones & Lamson Saddle Type Universal Turret Lathe with standard chucking equipment.

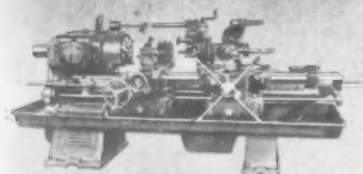
## **& LAMSON** **MACHINE COMPANY** **Springfield, Vermont, U. S. A.**



PROFIT PRODUCING  
MACHINE TOOLS

MANUFACTURERS OF: RAM & SADDLE TYPE UNIVERSAL TURRET LATHES . . . FAY AUTOMATIC LATHES . . . AUTOMATIC THREAD GRINDING MACHINES . . . COMPARATORS . . . AUTOMATIC OPENING THREADING DIES AND CHASERS

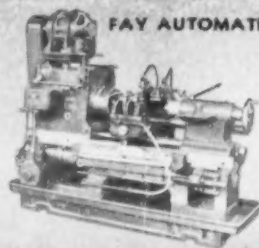
SADDLE TYPE  
UNIVERSAL TURRET LATHE



AUTOMATIC OPENING  
DIE HEADS



FAY AUTOMATIC LATHE



*Where stainless steels  
must be used---*



# ARISTOLOY STAINLESS

ONE OF THE FAMILY OF ARISTOLOY STEELS

To conserve nickel and chromium, all industry is cooperating to limit the use of stainless steels to vital applications where only stainless will do the job. For such applications Copperweld Steel Company is furnishing Aristoloy Stainless steel bars and billets. We'll be glad to discuss your stainless steel applications with your engineering staff.

**COPPERWELD STEEL COMPANY**

**WARREN, OHIO**

CARBON TOOL STEELS	 <b>ARISTOLOY STEELS</b>	ALLOY TOOL STEELS
AIRCRAFT QUALITY STEELS		<u>STAINLESS STEELS</u>
NITRALLOY STEELS		BEARING QUALITY STEELS

# "men, machines and *money...*"

United States Treasury's first  
Bull's-Eye Flag — next to the  
Stars and Stripes the proudest  
flag that EX-CELL-O ever flew!

Our Nation at war is much like a modern factory, where men, machines, and money are all required to do a successful job.

Proud of their accomplishment as builders of precision machine tools and aircraft parts, Ex-Cell-O men and management are even more proud to do their part in the broader aspects of war work—to join their fellow Americans in the regular buying of United States War Bonds.

*Ex-Cell-O receives with pleasure the United States Treasury Department's first "Bull's-Eye" flag—awarded for having enrolled more than ninety per cent of all employees in the Pay-Roll War Savings Plan, and for subscribing regularly more than ten per cent of the company's total pay roll.*

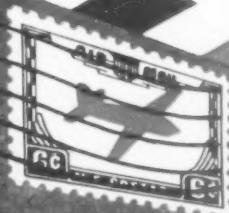
*Phil. Aubert*  
President

EX-CELL-O CORPORATION

XLO

EX-CELL-O means PRECISION

EX-CELL-O MANUFACTURES PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DIESEL FUEL INJECTION EQUIPMENT, R. R. PINS AND BUSHINGS, DRILL JIG BUSHINGS, PARTS . . . EX-CELL-O CORPORATION, DETROIT, MICHIGAN



**Rush it by**

**H**AS a problem of internal grinding got you bottle-necked? Are there too many operations, too much lost time, too many spoiled pieces?

Then rush it by air mail to Bryant. In these hectic days your own engineers have problems enough without losing sleep over this.

Rush it by air mail to Bryant. Not only does Bryant specialize on internal grinding equipment. Not only has Bryant production already tripled, it is constantly increasing. Not only is Bryant all out for war production. There's another factor—Bryant's *specialized* experience in this highly specialized field is unmatched by any other organization devoted solely to internal grinding problems.

That's why it pays to air mail your problems to Bryant. Whether you're striving for war production today or studying how to cut costs and earn profits on new products for future markets, Bryant wants to help you. The thing to do with an internal grinding problem is rush it by air mail to Bryant.

**BRYANT CHUCKING GRINDER CO.**

SPRINGFIELD, VERMONT, U. S. A.

***Air Mail to Bryant***





## **To plant supts.**

This is one of a series of ads addressed primarily to new grinder hands. If you would like additional copies without our signature, for your bulletin board, tell us how many you need.

### **HOW TO GET BETTER AND LONGER SERVICE FROM GRINDING WHEELS**

● Speeding production is only part of a grinder hand's wartime job. Basic materials must be conserved at the same time. With grinding playing so important a part in production, these simple rules may help you do both parts of your job better.



#### **1 MAKE SURE THE GRINDING WHEEL IS CORRECTLY MOUNTED**

To get the best service from grinding wheels, you must start with the right wheel and the correct set-up. Next it is important to make certain the wheel is properly balanced and correctly mounted. This must be done painstakingly to make sure it is in perfect balance and runs true without vibration or wobble. Where operators have difficulty doing this, they should ask their supervisors for instructions on proper balancing, truing and mounting procedure.

#### **2 MAKE SURE THE GRINDING MACHINE IS IN GOOD CONDITION**

The right wheel, the correct set-up and proper mounting are still not enough to insure long wheel life if the grinding machine itself is not in good condition. Bearings should be snug, foundations firm and every care taken to keep the machine as free from vibration as possible. The inspections and servicing necessary to maintain a grinding machine in tiptop condition will be paid for many times in longer wheel life, better work and higher production.

**THE CARBORUNDUM COMPANY • NIAGARA FALLS, N. Y.**

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

# HOW GOOD A *SCRAPPER* ARE YOU ?



How about taking *another* sock at the Axis—aside from the healthy punches you're delivering with war production? Round up all the iron and steel that it's not absolutely essential to keep. Do it both at the plant and at home. Then turn it in for scrap, even if some of it hurts!

In plain words, here's the picture. Steel producers are going to need several million *more* tons of scrap this year than ever before. If we don't get it, you won't get enough *new* steel; and if you're pinched, it's the boys on the fronts who will suffer. • It can be either a vicious or victorious circle. *Will you do your share—and more—to make it the latter?*



***Allegheny Ludlum***  
**STEEL CORPORATION**

GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA



# 5-METHOD

**COMPLETE TOOL SERVICE**  
*for* **MAXIMUM PRODUCTION**

*Many simple form tools from any  
of the Standard Tools*



In the extensive use of carbide tools in any shop, there will be instances where simple form tools are required.

The accompanying illustrations show only a few such tools that have been made from standard tool Style 15. When you consider all the standard tools that are available in this Method One and the many shapes that can be made from each tool, the number of operations that are handled with these standard tools and modifications of them is limitless.

Simplified tooling practice recommends this Method One wherever possible. Vascoloy-Ramet Standard Tools will simplify and speed-up your tooling work. The standard tool most closely meeting requirements is withdrawn from stock and ground to the desired shape.

For fast tooling, keep in stock a supply of Vascoloy-Ramet Standard Tools. Catalog VR-421 will help you select the standard tools you should have. Write for your copy.



*Ramet*  
**VASCOLOY-RAMET CORPORATION**

NORTH CHICAGO, ILLINOIS  
DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES  
IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

4255

TANTALUM-TUNGSTEN CARBIDE  
**FOR TOOL SERVICE..... Specify**

**Vascoloy  
RAMET**

**TOOLS**  
TANTUNG "G"

"... THEN THEY CALLED IN  
A BARNES MAN!"



A midwestern manufacturer was having "blade trouble." Uneven wear. The foreman blamed the machine. The set-up man thought it was the blades. The production manager said, "Let's call in a Barnes man. He'll tell us what's the matter."

Within a few hours the trouble was corrected.

Barnes service is as important to the Barnes conception of business as quality materials and workmanship. Making saws work is just as much a Barnes responsibility as making them well.

And, by the way, next time you open one of the green boxes of Barnes blades, look them over carefully. Notice their absolute *uniformity*.

### Call Your Distributor

Today your surest, quickest, most complete service for practically any staple industrial product is to be had from your Mill Supplies Distributor. Make a habit of calling him *first* when you need anything. And don't forget to ask for Barnes Blades with your next order.

**W. D. BARNES CO. INC.**  
DETROIT MICHIGAN

*A Barnes is Better*

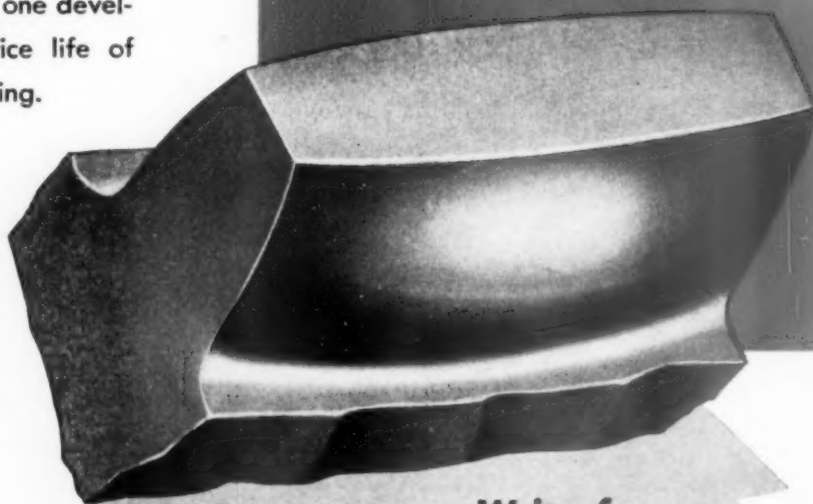


Red Ring Rotary Shaving finishes gear tooth surfaces accurately—faster than other methods and without producing any of those microscopic cracks in the tooth surface which are so hard to avoid with other gear finishing methods—and which are so prolific of fatigue failures in service. A Magnaflux test on shaved aircraft gears shows this conclusively.

This Patented Rotary Shaving Process which provides the Elliptoid Tooth Form has done more than any other one development to increase the service life of gears by eliminating end bearing.

Red Ring Shaving is an automatic process that is fast and economical. No skill is required in machine operation. It may, but need not, be followed by Red Ring Crossed Axes Lapping.

# **MAGNAFLUX TEST proves SUPERIORITY OF SHAVED GEARS**



**Write for  
Descriptive Bulletins**

**NATIONAL BROACH  
AND MACHINE CO.**

RED RING PRODUCTS  
5600 ST. JEAN • DETROIT, MICH.

SPECIALISTS ON SPUR AND HELICAL  
INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING  
AND ELLIPTOID TOOTH FORMS

...1500% is a lot of percent, Joe!

Dear Joe:

Madison, Wisconsin

If what goes on around here is any fair sample, we're really getting down to brass tacks about winning this war!

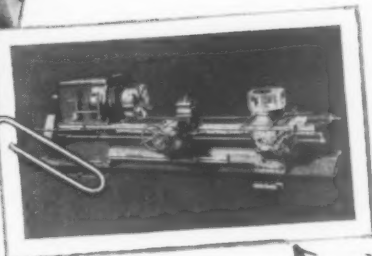
Herr Hitler isn't going to like this. But believe it or not, we're increasing production 1500% on our large sized turret lathes. That's a lot of percent, Joe! You can understand what it means in greater capacity to cut metals in the plants that are making tanks, guns, shells, trucks, and all the other equipment you fellows need.

Of course, it takes more floor space to do this. So we built a new addition to the old Northern Works. And the whole works will be devoted to building these two special "Victory" models. Actually, they're modified versions of the standard 3-L and 4-L Saddle Type jobs.

We're hard at it, Joe, working day and night. And we'd never have believed we could do so much in the time we've had. If news like this doesn't bring you a smile of confidence, we miss our guess.

Best of luck.

*The fellows at Gisholt*



↖ We're building the new "Victory" models in two sizes, 21" and 24" chucks; 5 1/4 and 7 1/4 spindle bores —



IT'S good news on the firing lines—or on the production lines! Get the facts about what Gisholt is doing to increase production in vital war plants—how Gisholt is helping to solve one of today's most pressing problems.

# CONSERVE CRITICAL MATERIALS— GET BETTER RESULTS with "THE VICTORY STEEL"

Graph-Mo Steel will outwear competing oil-hardening tool steels and will machine at least 25% faster than competing steels.

Now add to this the saving in critical materials that is obtained from the use of Graph-Mo Steel and you will understand why it deserves to be called "The Victory Steel."

As revealed in this chart, Graph-Mo uses no Chrome, no Vanadium, no Tungsten, no Manganese, and only .25 Molybdenum.

**THE TIMKEN ROLLER BEARING  
COMPANY, CANTON, OHIO**  
Steel and Tube Division

**PERCENTAGE OF ALLOYS IN OIL-HARDENING  
TOOL STEELS COMPETITIVE TO GRAPH-MO**

Steel	Silicon	Molybdenum	Chromium	Vanadium	Tungsten	Manganese
A		.20				1.60
B				.20	1.25	
C			.50		.50	1.20
D			.70		.50	1.00
E			.50	.20	.50	1.20
F			.50	.25	.45/.75	1.20
G						1.50/1.80
H			.50	.15	.30	1.30
I			.70	.11	.50	1.30
J			1.60		.45	
K			1.20	.20		.90
L			.27	.25		1.70
M			.40	.10		1.30
N			.60		.40	1.20
O			.50		.50	1.05
P			.50		.50	1.15
Q			.50	.25		1.25
R			.50		.50	1.20
S			.20			1.65
T			.50		.50	1.20
Graph-Mo	.75/.85	.25				

**SAVING  
IS FIGHTING**

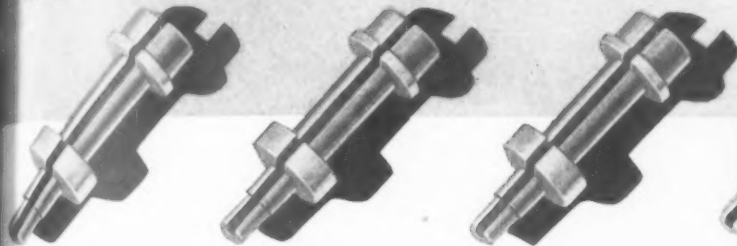
Graphitic Steels are in the front  
line of the conservation battle  
—will be doing a first rate  
constructive job in post-war  
competition — start  
using them now!

**TIMKEN**  
TRADE-MARK REG. U. S. PAT. OFF.  
**GRAPHITIC STEELS**

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

# Engineered Production

**1800**  
*Pieces an Hour*  
**ON PARTS LIKE THIS**



**with Sundstrand No. 00 Rigidmil**

Sundstrand Engineered Production on No. 00 Hydraulic Rigidmil illustrated provides unusual table-cycle and special fixture . . . nets 1800 pieces an hour climb-milling slots in small brass parts. Slots are 0.057" wide  $\pm 0.002$ "; 0.281" deep  $\pm 0.001$ "; 1 1/2" long. Same machine can be changed over quickly, with



different fixtures and cutters, for high speed milling of other parts. Remarkable range of speeds, feeds, cycles, make standard Sundstrand Rigidmils best choice for war work and coming peacetime jobs.

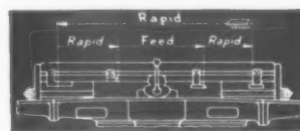
**Get High Output Milling Small Parts For Firearms, Fuses, Bombs, Instruments, Controls, Fuel Pumps, Similar Work**

## *Speeds for Everything...*

Patented high-ratio head of No. 00 Rigidmil is made in two speed ranges, each having 64 spindle speeds — Type A, 57 to 2416 r.p.m.; and Type B, 85 to 3600 r.p.m. — for best milling in materials from steel to aluminum or magnesium.

## *Feeds for Everything...*

Standard Sundstrand Hydraulic Feed Unit gives any desired feed rate from 1/2" a minute to 37" a minute; or optional range from 1 1/4" to 65" a minute. Simple adjustment provides fast feeds for roughing cuts, slow feeds for fine finish.



## *Cycles for Everything*

Rapid traverse at 400 inches a minute and hydraulic feed gives fast, accurately controlled, one or two-way, continuous or semi-automatic table cycles; provides high production at a minimum of operator effort. Easily adjusted standard dogs establish all usual table-cycles. Sundstrand Engineered Production Department will recommend special dogs and cycles for unusual conditions. Diagram shows cycle used on above job; includes three standard dogs and one special.

*Early Deliveries . . .* Standard No. 00 Hydraulic Rigidmils are available for early delivery. Write for full information.

**GET FREE BOOK** ➔

Get complete information about capacity, speeds, feeds, cycles and distinctive advantages of Sundstrand No. 00 Rigidmil by writing for booklet shown at right. Includes cycle diagrams and specifications. Ask for Bulletin '804.



**SUNDSTRAND MACHINE TOOL CO.**

**2532 ELEVENTH STREET, ROCKFORD, ILLINOIS, U. S. A.**

**Do you realize what your own Distributor is doing to help you keep going today?**



Your Industrial Supply House' big, modern Catalog is just as vital to your Purchasing Department as:

- your marketing records are to your Sales Manager
- accurate credit information is to your Accounting
- Production Charts and Cost Sheets are to your Management Executives
- because it provides one indispensable, central point for locating whatever you need in plant equipment and supplies.

Each of these big books may list 15,000, 25,000 or even more separate items—the Distributor normally carries many thousands of them in stock for immediate delivery to you.

Your Distributor has facilities and a trained staff to give you *specialized service*—he is in constant touch with scores of manufacturers producing every kind of plant machinery or supplies. He frequently can help your Purchasing Department to locate and expedite the materials you need most to keep your production schedules rolling.

Take the Mill Supply Distributor into your "Company family." He will quickly earn *your* respect and confidence just as he has earned ours.

Because for many years, Industrial Supply Houses have been our Representatives in selling Cle-Forge High-Speed Drills and Peerless High-Speed Reamers throughout the United States.

The **CLEVELAND** TWIST DRILL COMPANY  
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES  
 30 READE ST. NEW YORK 9 NORTH JEFFERSON ST. CHICAGO 650 HOWARD ST. SAN FRANCISCO  
 6515 SECOND BLVD. DETROIT LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST. E.C.4



"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

# AUTOMATIC CHUCKING EQUIPMENT

*is speeding the great  
war effort . . . . .*



With the battle of production resolving itself into a battle against time, any equipment which can turn out more work hour after hour is making a real contribution to today's most urgent needs.

Potter & Johnston Chucking Equipment is not only making time savings in the duplication of parts but is also turning out parts which meeting the most rigid specifications for accuracy, are ready for assembly without delay.

Potter & Johnston machines are in use today producing airplanes, airplane engines, tanks, Bofors guns, 90 mm anti-aircraft guns, machine guns, adaptors for shells, the American Oerlikon gun and other vital implements of defense.

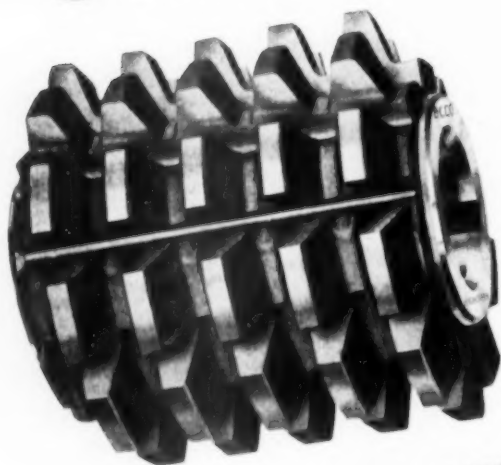
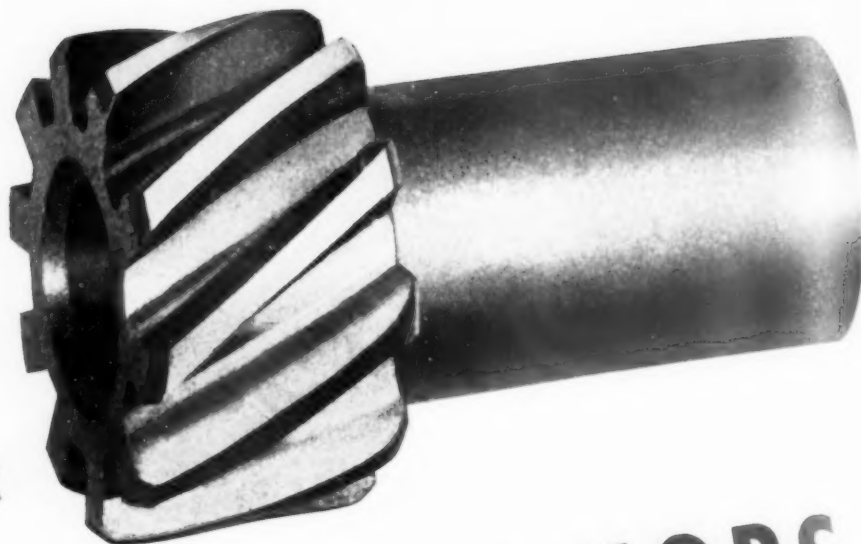
Ease and convenience in handling even intricate operations at top speed on P&J equipment is a further contribution by Potter & Johnston in helping speed the war effort.

**he POTTER & JOHNSTON  
MACHINE COMPANY**

PAWTUCKET . . . . . RHODE ISLAND

# HOBGING DISTRIBUTOR GEARS...

## 30 PER HOUR



# WITH B-C HOBS 1000 GEARS PER SHARPENING

## SET-UP AND PRODUCTION DATA

Piece — Distributor Gear.

Material — Heat Treated Cast Iron, Brinell 269-302.

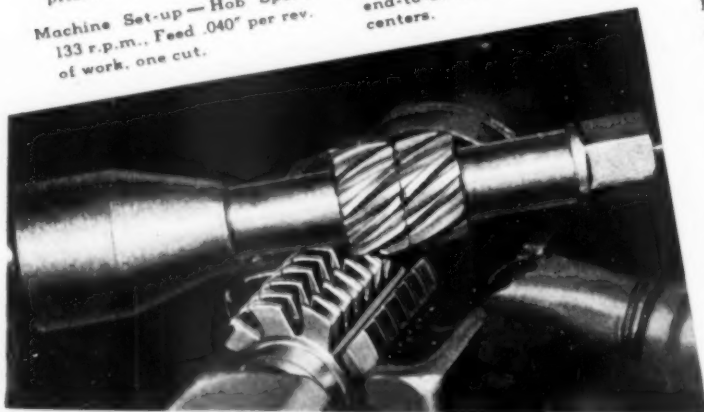
Dimensions of Gear — 1.124" O.D.,  $\frac{3}{8}$ " face, 10 teeth, 12 pitch,  $14\frac{1}{2}$ " P.A., 30° helix.

Machine Set-up — Hob Speed 133 r.p.m., Feed .040" per rev. of work, one cut.

Production — 30 pieces per hour per machine. Four machines per operator.

Hob — B-C 2"x2"x $\frac{3}{4}$ " hole, single thread, GROUND. Hob is used in 2 positions, 500 pieces per position 1000 pieces per sharpening.

Work — Held 2 pieces per load end-to-end, on arbor between centers.



THESE HEAT-TREATED cast iron distributor gears are required to have a backlash of not more than .003" when rolled with a full-sized master gear. B-C GROUND HOBS are used and the job is run on a battery of eight Barber-Colman standard No. 3 Hobbing Machines. Two operators, each handling four machines, produce about 1750 gears in each 8-hour shift, or over 5000 gears a day when working 24 hours. Each load, consisting of two gears placed end-to-end on an arbor, as shown in the illustration below, takes less than 4 minutes to cut, giving an average production of 30 pieces per machine per hour. Each hob is used in two positions, cutting 500 gears per position, or a total of 1000 pieces before being resharpened. This is a good demonstration of the productive capacity of B-C GROUND hobs and the whole job is a fine example of consistent accuracy under long-run commercial production conditions. B-C GROUND Hobs are turning in many similar performances and are recommended where PRODUCTION AND ACCURACY are both of prime importance.

# BARBER-COLMAN COMPANY

General Offices and Plant 213 Loomis Street, Rockford, Illinois, U. S. A.

BARBER  
B-C

COLMAN  
PRODUCTS

HOB, HOBGING  
MACHINES, HOB  
SHARPENING MA-  
CHINES, REAMER,  
REAMER SHARP-  
ENING MACHINES,  
MILLING CUTTERS,  
SPECIAL TOOLS

# Lo-swing FEATURES

## SAVE TIME AND TOOLS

MECHANICALLY-OPERATED BRAKE AUTOMATICALLY  
CONTROLLED BY HAND STARTING & STOPPING LEVERS

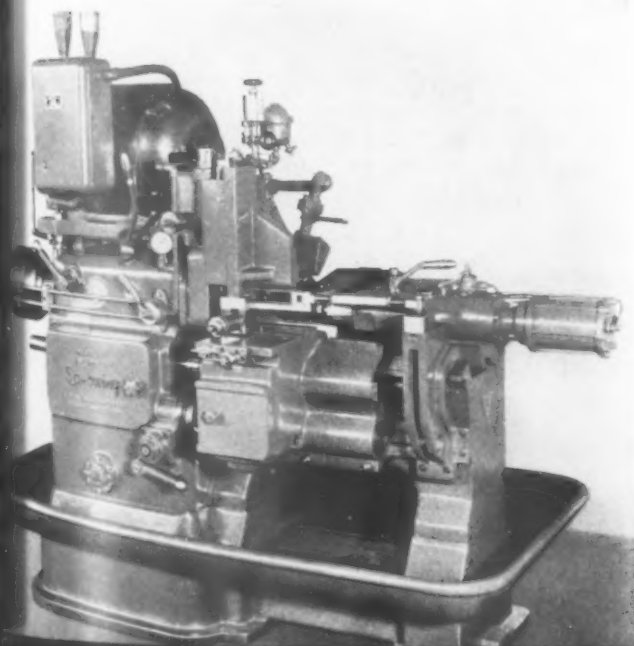
SMOOTH DRIVE THRU MULTIPLE  
"V" BELTS FOR HIGH SPEEDS

FEED THROWOUT HANDLE STOPS FEED  
WITH SPINDLE STILL TURNING

HAND CRANK FOR PUTTING  
MACHINE THRU CYCLE MANUALLY

RAPID TRAVERSE CONTROL HANDLE  
SAVES TIME WHEN SETTING-UP

Model LR Lo-swing equipped with  
Third Slide and tooled for auto-  
matic production of trench bombs.



● With the nation at war, *time* and *tools* are two things that must be conserved. Standard Lo-swing Lathe design incorporates many features that make such conservation easy even under the pressure of war production. Note the five built-in features listed above. Consider the importance of the *Feed Throw-out Handle*, for example, when cutting with cemented Carbide tools. If one tool breaks, this lever permits the operator to withdraw all tools before stopping spindle rotation, thus avoiding breakage of the other costly Carbide tools.

*Lo-swing efficiency is helping to speed America's war production.*

SENECA FALLS MACHINE COMPANY • SENECA FALLS, N. Y.

# Lo-swing LATHES

# "War-Made Friends"

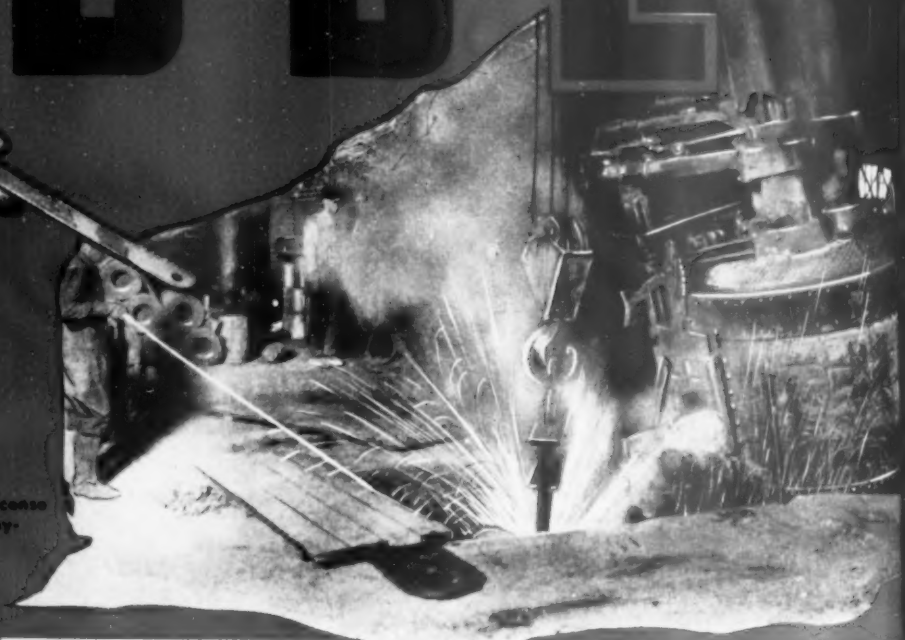
## HACK SAW BLADE USERS and INGERSOLL



# D-B-L



Produced under exclusive license  
arrangement with Allegheny-  
Ludlum Steel Corporation



### Other Special INGERSOLL Sheet Steels include:

Alloy Steels  
Armor Plate  
Clutch Plate Steels  
Tillage Steels  
Soft Center Steels  
Shovel Steels  
Knife Steels  
TEM-CROSS Steel  
IngAclad  
(Stainless-Clad Steel)  
Stainless Steels and Saw  
Steels, including "18-4-1"  
and Molybdenum and  
D-B-L Hack Saw Steels

In a great many plants Ingersoll D-B-L Steel has made warm friends of those who buy and use Hack Saw Blades . . . In some cases only the necessary conservation of vital alloys gave D-B-L a reluctant first trial . . . Today in these same shops D-B-L is enthusiastically accepted and approved because it is so high in impact resistance, provides so tough a cutting edge, and is so relatively free from decarburization.

These advantages, plus *lower cost*, have won for Ingersoll D-B-L Hack Saw Steel a permanent place along with Ingersoll 18-4-1 and Molybdenum which were pre-war favorites.

*Specify Ingersoll D-B-L Steel on orders for Hack Saw Blades*

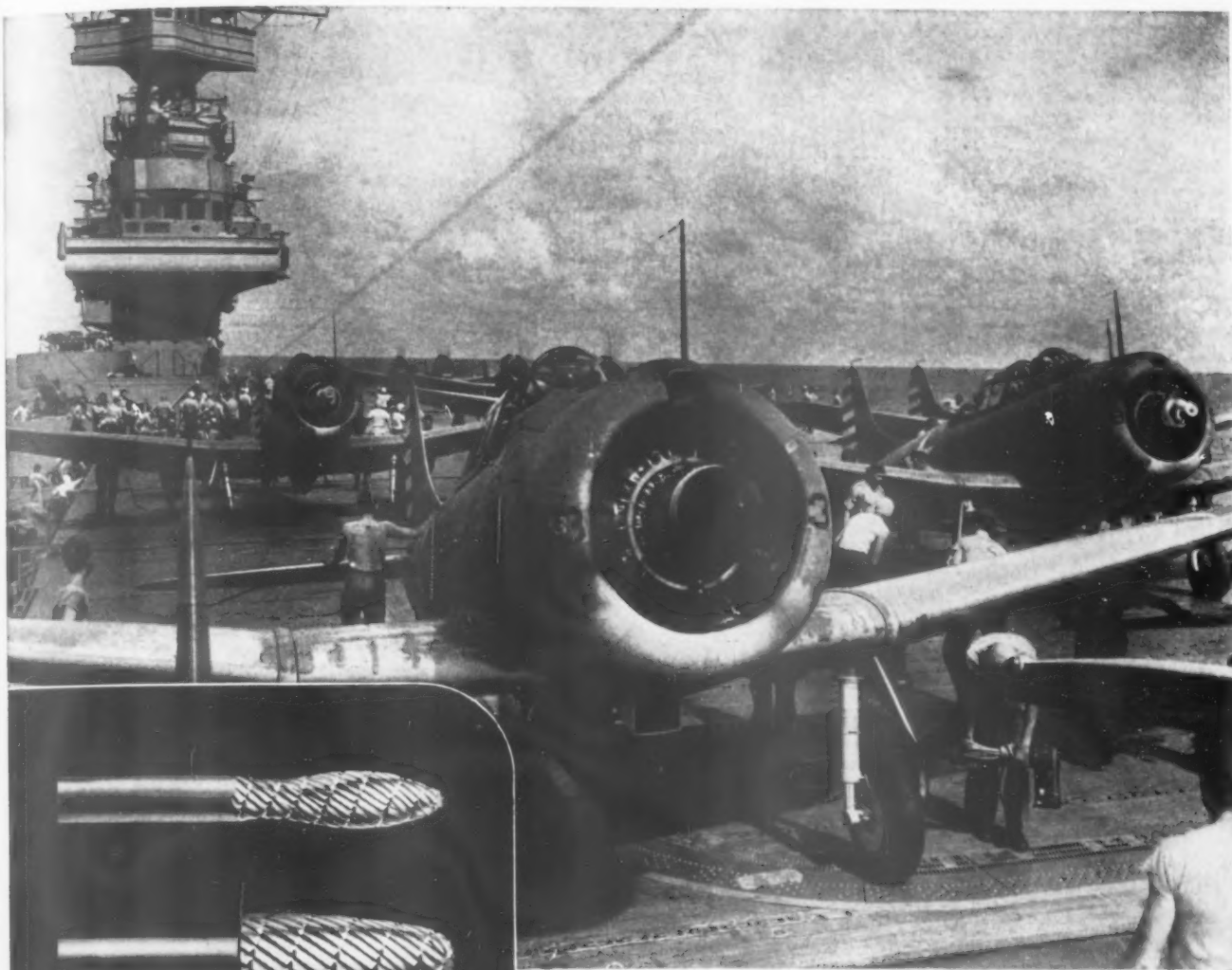
**INGERSOLL STEEL & DISC DIVISION**  
**BORG-WARNER CORPORATION**

New Castle, Indiana

Plants: New Castle, Ind.; Chicago Ill.; Kalamazoo, Mich.

# INGERSOLL

**SPECIAL STEELS  
for SPECIAL USES**



OFFICIAL U. S. NAVY PHOTOGRAPH

# Jarvis

## POWER TOOLS

### READY FOR ACTION

Jarvis Power Tools as used in the manufacture of engines, propellers, planes, ship and instruments have done their part.

**THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.**

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

# BOUT of the O'TOOLS

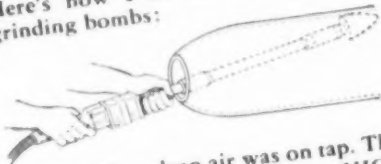
## ROUND 8

10 ROUNDS—  
AIR VS. HIGH-CYCLE  
GRINDERS



### WAR WINNER'S REPORT TO: Uncle Sam

Here's how I licked the problem of grinding bombs:



Plenty of dry, clean air was on tap. They didn't have to spend \$832 for a HIGH-CYCLE converter.

Gave them a 26" extension grinder to reach inside the bombs (see sketch). This was 5 lbs. lighter on a power-for-power basis than my HIGH-CYCLE opponent.

Since the job required a lot of in-and-out handling, my lighter weight and simplified build got the decision to turn out the bombs faster.

**AIR O'TOOL**  
(Winner, Round 8, Bout of the O'TOOLS)

### "AIR" helps us get at TOKYO

Here, Rotor Air Grinders licked a problem of getting at the burrs inside bombs—to help U. S. bombers get at the Tojos inside Tokyo.

To make sure this grinding job would be done as thoroughly as the bombing job to come, the Rotor Analyst let AIR and HIGH-CYCLE decide which could turn 'em out fastest. Guesswork is out when the O'Tools have it out!

AIR won this Round 8. See his report.

Are you getting the kind of results from portable tools that can whip the Axis? Call in the unbiased Rotor Analyst to blast away the obstacles.

**KEEP 'EM RUNNING!** Get your free copies of the booklet and wall chart on maintenance of portable tools.



**AIR**

# THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



**HIGH CYCLE**



HOW **GORTON**

*saves time*  
ON

**PROFILE MILLING**

WITH SEMI-SKILLED OPERATOR



**GORTON**

***9-J Super-Speed Vertical Mill with  
Duplicator Table and Tracer Profiles Crank-  
shaft Part in 15 Minutes Floor-to-Floor Time***

• This prominent airplane engine manufacturer (name on request) utilizes semi-skilled help for operating Gorton Super-Speed Milling Machines and Duplicators. The operation being performed is *Profile Milling of a .738" Radius on the Rear Section of a Steel Crankshaft*. Feed is by hand, spindle speed is 500 r.p.m. using a special .738" diameter four-fluted ball cutter. (This cutter is ground on a Gorton 375-2 Cutter Grinder.)

This is an excellent example of the ease of operation of Gorton High-Speed Millers and Duplicators in performing unusual operations.

AN EASTERN MANUFACTURER OF TOOLS AND DIES WRITES: "... MOST IMPORTANT TODAY IS THE FACT THAT WE CAN USE WOMEN TO OPERATE THESE MACHINES."

These are but two of many ways in which Gorton Super-Speed Milling Machines are saving vital man hours on form milling. Perhaps you, too, can save additional hours on your present or new milling equipment. Gorton Engineers, specialists in Vertical High-Speed Milling, will be glad to make recommendations on your work—without obligation.

**SUPER-SPEED  
MILLING DATA**

**OPERATION**—Profile Mill .738" Radius.

**MACHINE**—Gorton 9-J Super-Speed Vertical Mill with Duplicator Table and Tracer.

**PART**—Rear of Crankshaft—Steel.

**CUTTERS**—Special .738" dia. Ball Cutter—Profile Form Type—4 Flute.

**HOLDING**—Special Fixture.

**FEED**—Hand.

**SPINDLE SPEED**—500 r.p.m.

**STOCK REMOVED**— $\frac{1}{8}$ ".

**FLOOR-TO-FLOOR TIME**—15 Minutes.

**FREE**

Additional data and specifications are included in this booklet. Write for your copy today. Ask for Catalog No. 1400-B.

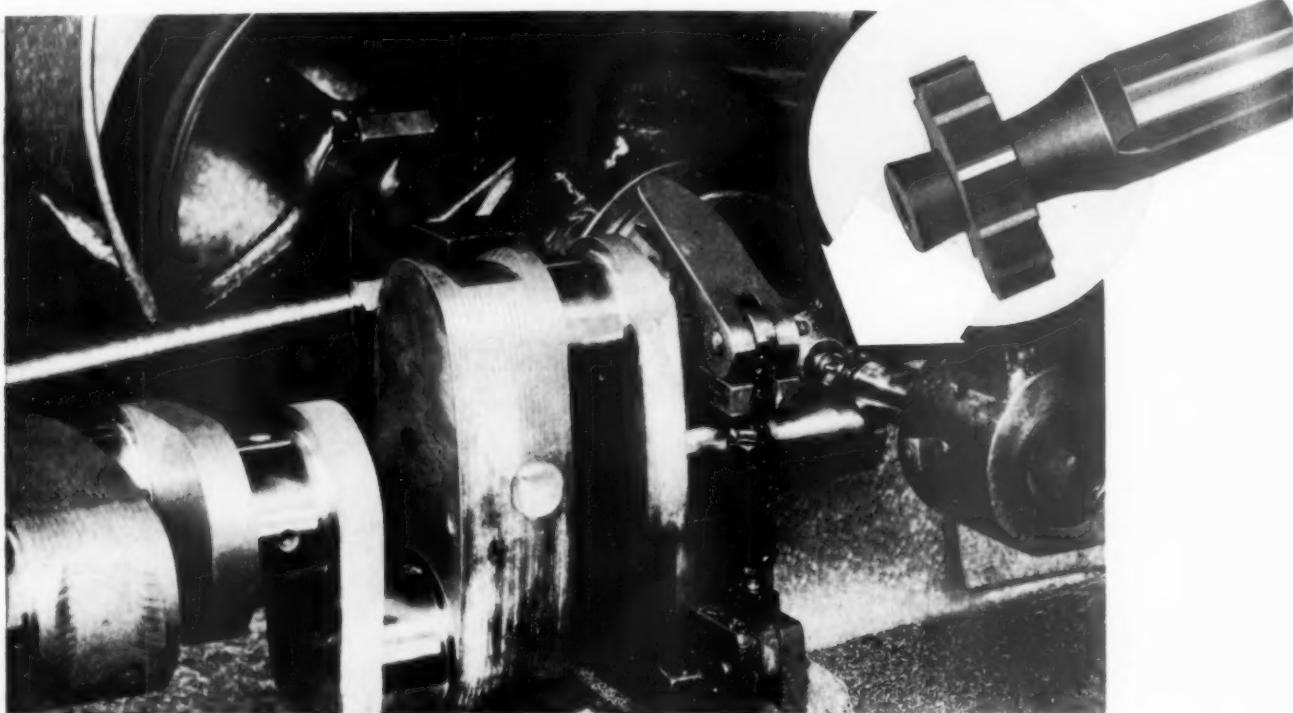


**GEORGE GORTON MACHINE CO.**

1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.

SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING

# You can take heavier cuts at Faster Speeds with **MIDWEST KEYWAY CUTTERS...**



Here are **3** important reasons *why*—

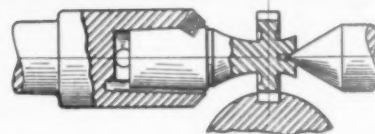
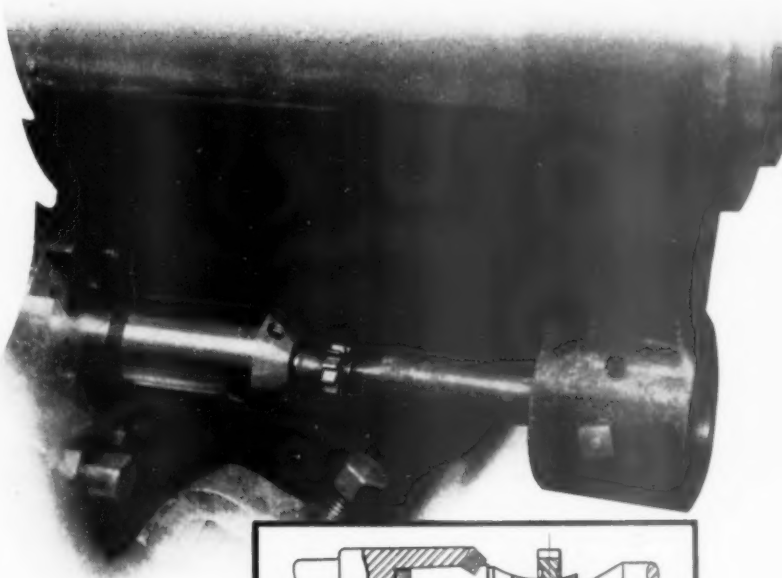
**1—SUPPORTED AT BOTH ENDS**—the cutter is made with an extended center which provides a support for it at the outer end, thus both ends of the cutter are supported, giving absolute rigidity to the operation.

**2—THE POSITIVE DRIVE**—Midwest Cutters have a stub taper shank with a groove to fit a pin that is partly embedded in the wall of Midwest patented Taper and Pin Drive Holders. Full driving energy is exerted along the entire length of the shank, giving the cutter absolute rigidity and perfect alignment. No parts easily dislocated or lost are employed.

**3—SCREW LOCKED**—the cutter shank is designed for positive locking to the holder by a lock-screw which bears against the angular flat on the shank of the cutter. Cutter vibration is eliminated.

**MIDWEST TOOL & MFG. CO.**

2364 W. Jefferson Ave. • Detroit, Mich.



This sectional view of a Midwest Keyway Cutter set-up shows the Extended Center which provides an outer support for the cutter; the Taper and Pin Drive; and the Screw-Lock between the cutter shank and holder.

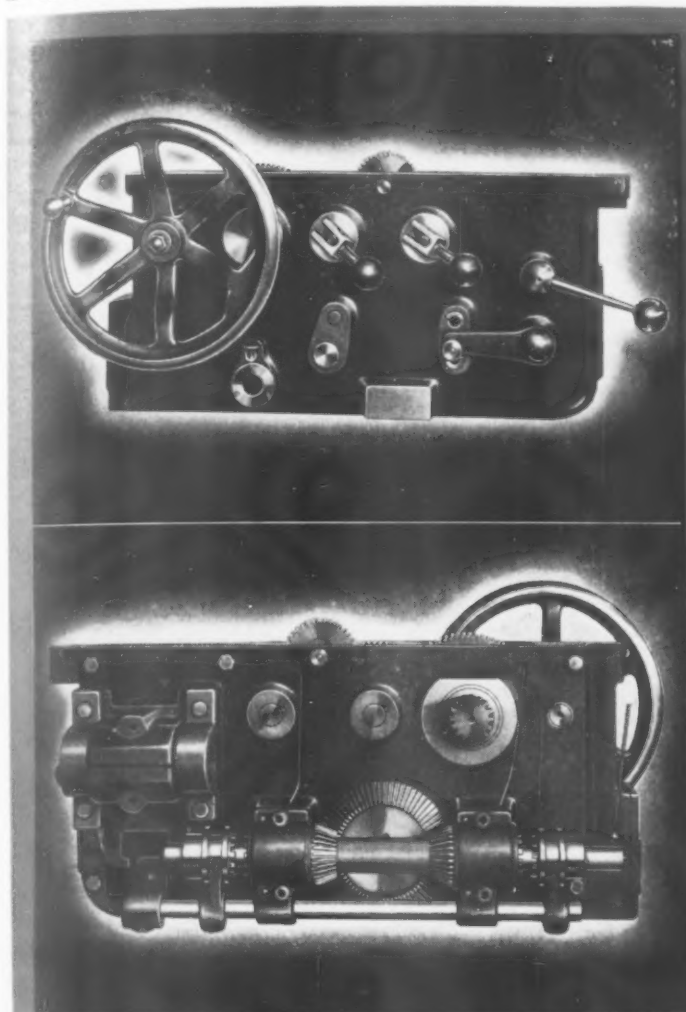


END MILLS • SLEEVES • COUNTERBORES • DRILLS • SPECIAL TOOLS  
REAMERS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS



*Precision* **METAL CUTTING TOOLS**

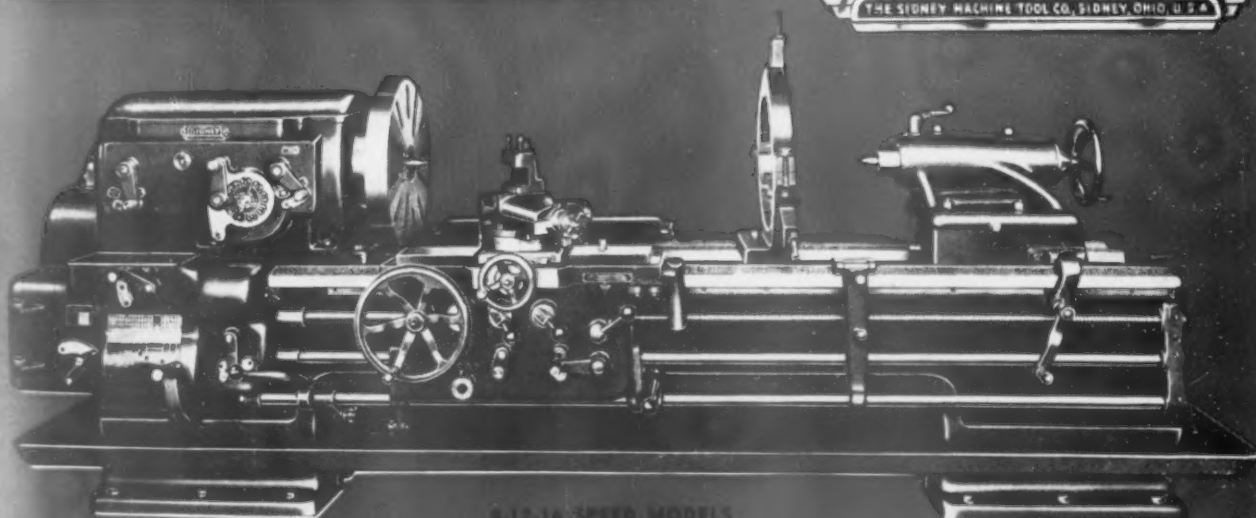
DOUBLE WALL APRON . . . ANOTHER STURDY FEATURE OF



**Sidney  
Lathes**

The Double Wall Apron is another point indicative of the modern design and sturdy construction of Sidney Lathes. This double wall Apron provides support to both ends of the heat treated shafts on which alloy steel gears are carried. Rack pinion and all shafts are anti-friction mounted. Snap levers actuating serrated tooth clutches control longitudinal and cross feeds. All controls are conveniently located for quick, easy operation.

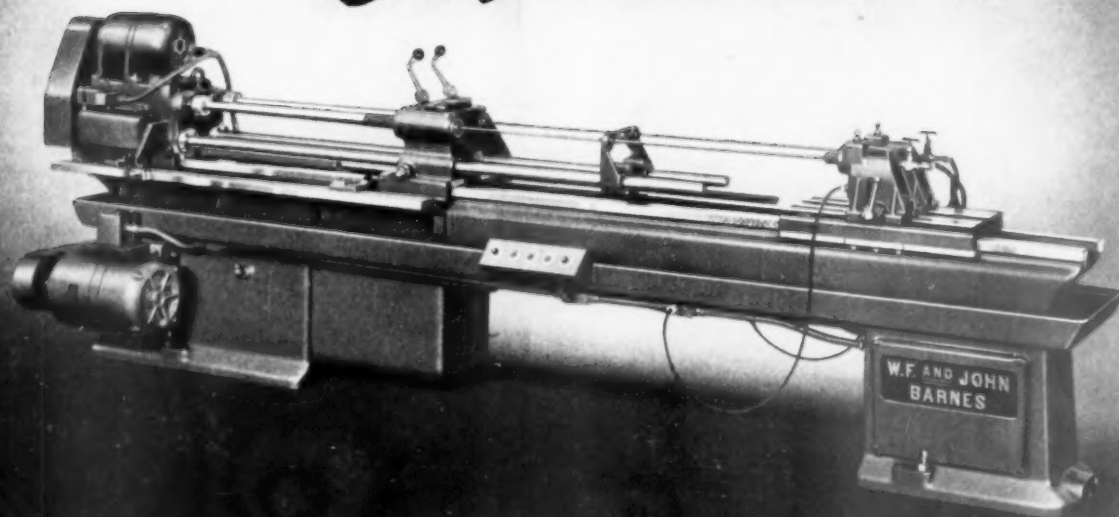
*Bulletins for this and other models immediately available*



8-12-16 SPEED MODELS  
14"-36" CAPACITY RANGE

**The SIDNEY MACHINE TOOL Company**  
SIDNEY U.S.A. OHIO

# FOR DEEP HOLE DRILLING...



## W. F. and JOHN BARNES 410 RIFLE DRILLER

**T**HIS two-spindle Rifle Driller was designed primarily for the drilling of rifle barrels up to .50 calibre. But—it is not limited to rifle barrels *only*. It is suited to deep hole drilling of diametrically balanced parts.

It is furnished in three standard sizes with strokes of 24" — 36" — and 48". Spindle speed may be varied from 1000 r.p.m. to 2000 r.p.m. through sheave and vee-belt changes.

Controlled hydraulic actuation from a self-contained unit of our own design imparts a positive feed to the barrels. Drills feed through the last fraction of the cut, instead of breaking through.

The tool holders, provided with torque overload protectors are mounted on a common saddle and can be moved on individual ways to accommodate variations in tool length.

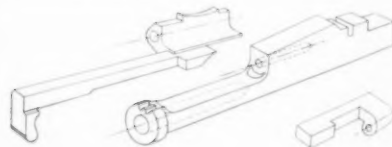
### FREE DESCRIPTIVE FOLDER...

Write today for free folder describing the 410 Rifle Driller. If you have non-symmetrical parts to drill, send us your part print and we will quote you on a 410 machine and furnish a production estimate.



### FOR NON-SYMMETRICAL PARTS

● You can readily equip a W. F. and John Barnes 410 Rifle Driller to drill non-symmetrical parts through the use of cradle-type fixtures, or by counterbalancing the chucks. A few typical parts are illustrated below.

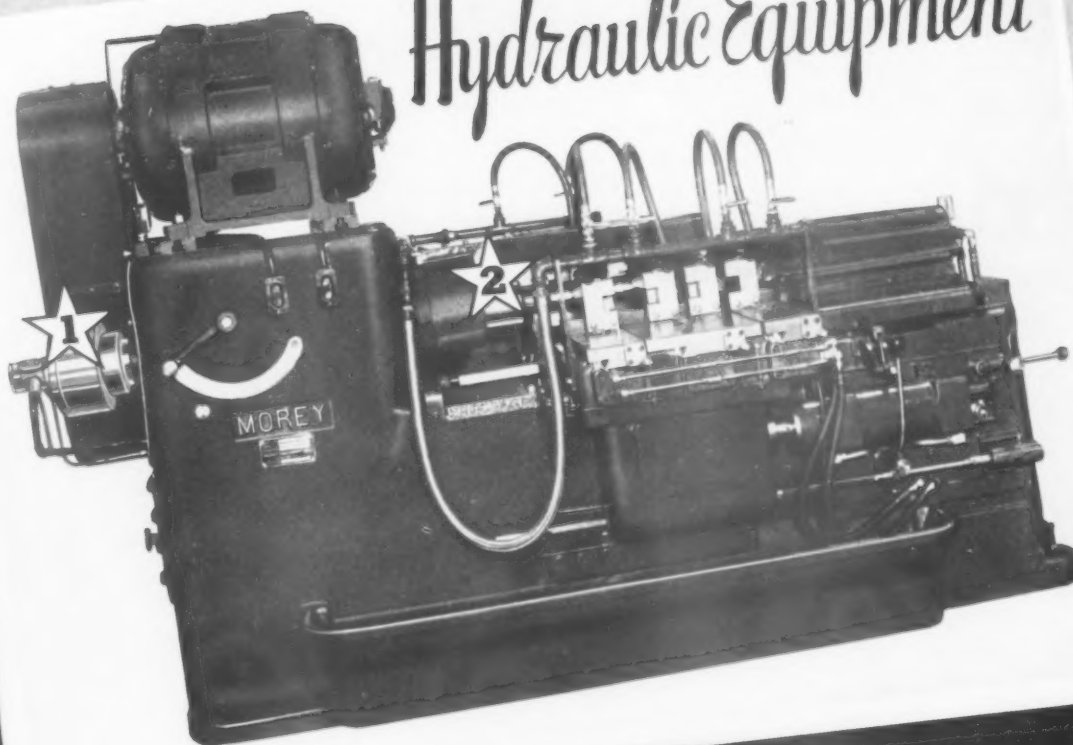


**W. F. and JOHN BARNES**

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

# **“LOGAN”**

*Hydraulic Equipment*



## **As Applied To MOREY “27” SHELL LATHE**



“LOGAN”  
MODEL “HR”  
HYDRAULIC  
CYLINDER



“LOGAN”  
EXPANDING  
MANDREL

**T**HIS Morey Lathe is tooled for rough turning shells. For holding the work, a “LOGAN” Expanding Mandrel is used. This mandrel is actuated by a “LOGAN” Model “HR” Rotating Type Hydraulic Cylinder fitted to the headstock. “LOGAN” Hydraulic Equipment provides rapid, positive action and rigid support of the work. “LOGAN” Representatives and “LOGAN” Engineers will be glad to make recommendations on your problems.



**LOGANSPORT MACHINE, INCORPORATED**  
902 PAYSON ROAD  
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories



# THE TOUGHEST, FASTEST, MOST EFFICIENT GEAR BOX DRIVE A Man Can Ask For!

**TURNER**  
**UNI-DRIVE**  
Motorizes Machine Tools



For Lathes, Milling  
Machines, Shapers,  
Turret Lathes, Ra-  
dial Drills, Boring  
Mills, Hobbing Ma-  
chines and various machine tools  
...also Brown & Sharpe and Clevel-  
and Automatic Screw Machines.

## SOME USERS OF TURNER UNI-DRIVE

American Brake Shoe & F. Co.  
Kellogg Division  
Southern Wheel Division  
Arnold Schwinn & Co.  
Augusta Arsenal  
Bendix Aviation Corp.  
Cessna Aircraft Corp.  
Chicago, Rock Island &  
Pacific R. R. Co.  
Chicago Screw Company  
Combustion Engineering Co.  
Congoleum Nairn, Inc.  
Driver Harris Co.  
Electric Auto-Lite Co.  
Frankfort Arsenal  
Frisco Lines  
Imperial Brass Mfg. Co.  
International Projector Co.  
Kohler Corp.  
Koppers Corporation  
Missouri Pacific R. R. Co.  
Monsanto Chemical Co.  
The New York Air Brake Co.  
Ohio Pattern and Fdry. Co.  
Pennsylvania Railroad  
Pomona Pump Co.  
Proctor & Gamble Co.  
Republic Steel Corporation  
Revere Copper and Brass, Inc.  
SKF Industries  
Sullivan Dry Dock Co.  
Thos. A. Edison Co.  
The Timken-Detroit Axle Co.  
Toledo Scale Co.  
Wabash Railway Co.  
Wagner Electric Co.

The old way is too slow today. More speed... greater production... you must have them to keep apace! Enlist the aid of TURNER UNI-DRIVES. They'll increase production like an extra shift... save time... speed up work... keep down power costs. They're doing it in scores of shops and plants. They'll do it in yours. TURNER UNI-DRIVE is the *successful* motor drive.

Easily and quickly installed. They do away with overhead counter shifts... no belts to shift. Increase the efficiency of machine and operator. Drive on large cone at all speeds. One trial will thoroughly convince you. Right now—today... investigate TURNER UNI-DRIVE. See your dealer, or write or wire us for full information.

## THE TURNER UNI-DRIVE COMPANY

(Sales Division: Turner Machinery Company)

3416 Terrace St.

Kansas City, Mo.

(5)

# Heald 3 POINT SERVICE

## *Keeps Production Rolling*

### 1. Field Engineering Service

With a Heald branch office located in all primary manufacturing areas and service dealers closely affiliated with the Heald organization in other industrial centers, manufacturers having any precision finishing problems can obtain prompt and often definite data right at home in their own office by calling a local Heald representative.

### 2. Factory Engineering Service

Where the information demanded is of an involved nature and requires more complete analysis with drawings and building of special units, then our engineers at Worcester are taken into consultation. They have innumerable records at their finger-tips and experience of some 40 years to draw from, furnishing results in minimum time.

### 3. Demonstration and Maintenance Service

Once the equipment is shipped our demonstration service takes over and makes every effort to put the machine in production as promptly as possible and then keep it producing. Once having a Heald product installed this department functions as a watchdog keeping tabs on the equipment to the satisfaction of the customer.

#### GRINDS 24 HOLES IN AIRCRAFT DRIVE ASSEMBLIES

Aircraft drive assemblies have 12 pairs of .875" diameter holes, 24 in all, which require grinding. In order to grind all of these holes in a single setup Heald Factory Engineering Service designed an indexing fixture for the job. In addition they recommended a grinding wheel sufficiently long to permit grinding a pair of holes simultaneously. By this method it is possible to grind each pair of holes dead-in-line and by indexing to obtain close center distances between holes.

**THE HEALD MACHINE CO. WORCESTER, MASS., U. S. A.**  
**MANUFACTURERS OF PRECISION BORING AND PRECISION GRINDING MACHINES**

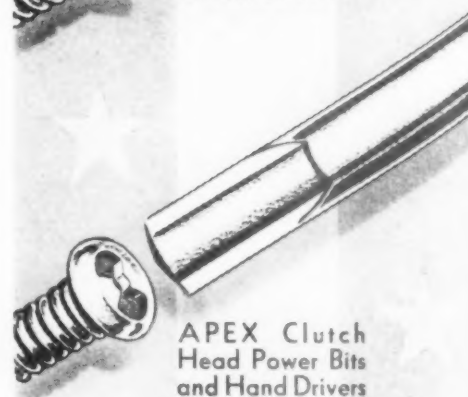
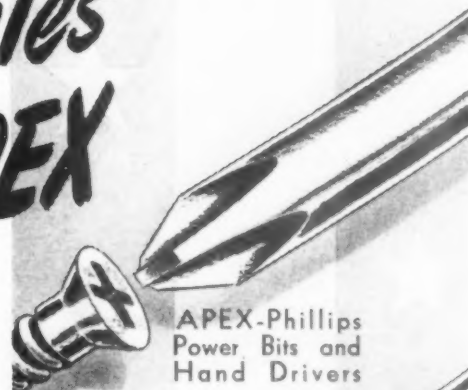


# *Production Schedules move up with APEX*

- APEX Power Bits and Hand Drivers have established phenomenal production records for long life and continuous service. Reasons: finest tool steel obtainable for the purpose; precisely engineered for each power driver; precision machined; properly and carefully heat-treated for toughness and long life.
- In addition, APEX-Phillips Power Bits can be reconditioned time after time at a substantial saving. Each reconditioning shortens the Bit only  $\frac{1}{8}$ ", and it is just as serviceable as a new one.
- APEX Clutch Head Bits can be reconditioned by the user. As the Bit wears, it is only necessary to grind away the worn section. APEX Clutch Head Bits are made to accommodate several grindings.
- Write for catalogues.

# APEX

**The APEX Machine & Tool Co.**  
Dayton, Ohio





# IT'LL TAKE PLENTY OF

# Scrap

# TO WIN THIS FIGHT!

**3 Million Tons of iron and steel scrap are wanted every month . . . Are you doing your part to help America win her battle of production?**

## **CONSERVATION AUTHORITIES RECOMMEND THESE 8 STEPS TO GET IN THE SCRAP**

**1** Put some one individual in charge of scrap in all departments of your business and GIVE HIM AUTHORITY TO ACT.

**2** Comb the plant and yards for dormant scrap, abandoned equipment, old boilers, pipe, moulds, obsolete dies and parts, material now being destroyed which has salvage value.

**3** Survey all plant equipment, particularly idle standby or discarded machines, with a view to applying or converting them to useful production.

**4** SEGREGATION:

Identify, classify and segregate scrap and supervise its handling to avoid contamination. This will increase its value.

Provide separate containers, clearly marked, for each class of scrap material.

Repair or rework worn or broken cutting tools. Keep unusable small pieces and turnings segregated. Even high speed steel grinding dust is valuable.

Dismantle discarded equipment promptly into its components—electrical, fastenings, lumber, etc.—so that these parts may be utilized or scrapped.

Sort blanks, short ends, cut-downs, clippings, etc., for possible reuse for smaller parts made in the same or other departments.

Recover and reclaim used cutting oils, lubricants, surplus paints and spray finishes.

Sort sweepings and miscellaneous waste to recover scrap values.

**5** Constant reminders in the form of posters, illustrations of right and wrong methods, pay envelope enclosures, house organ publicity, etc., are potent aids to the conservation program.

**6** Release for scrap, obsolete engravings, electrotypes, and standing types for catalogs, forms and advertising material.

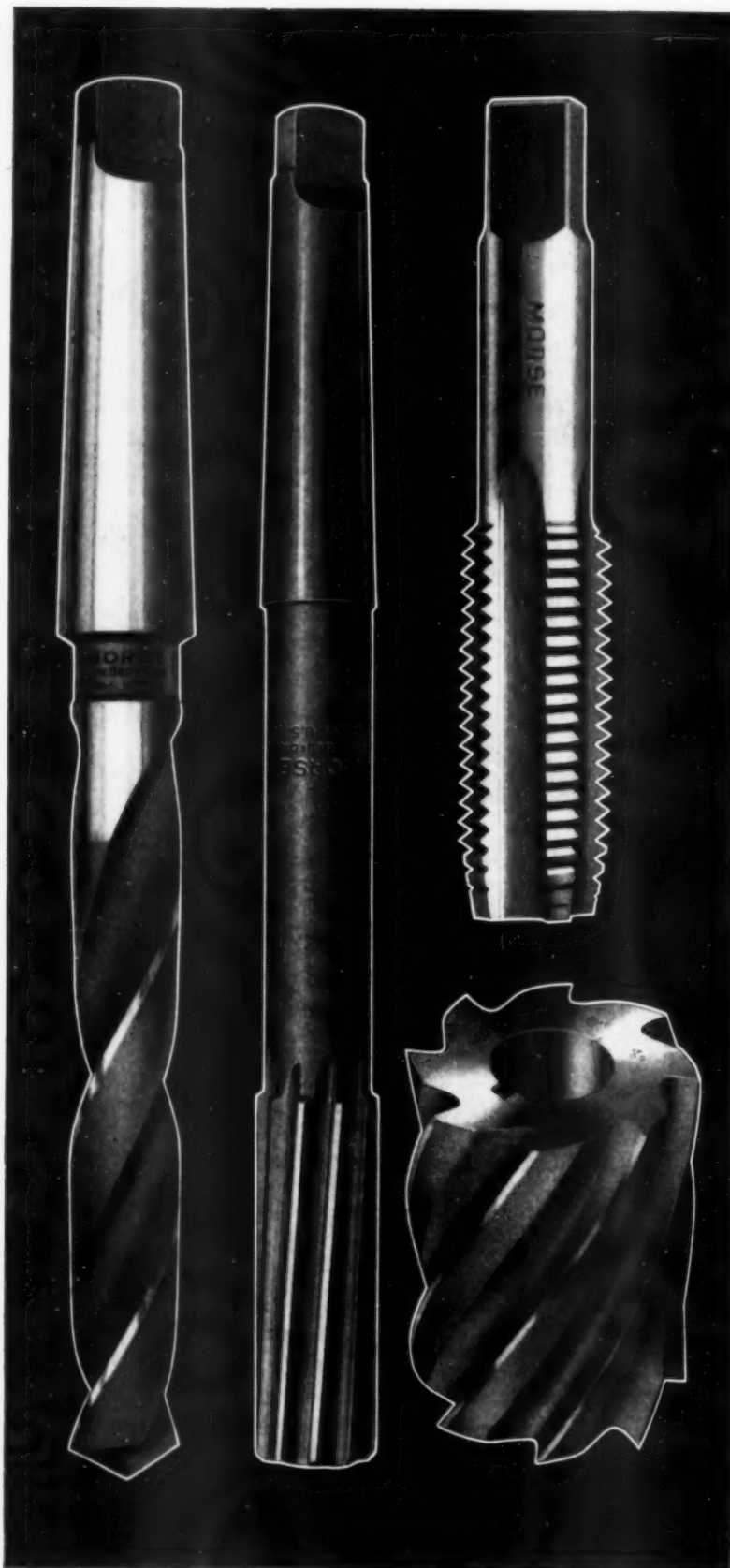
**7** Inspect all refuse to detect avoidable waste and excessive rejections. Educate production executives to correct such conditions at the source.

**8** For information and assistance on special phases of conservation and salvage communicate with Industrial Salvage Section, Conservation Division, War Production Board, 9th Floor, Washington Gas Light Building, Washington, D. C., or with nearest regional office

*The metallurgical experience of our technical staff is available to aid you in these and other technical phases of metal salvage.*

**KEEP SCRAP MOVING INTO WAR PRODUCTION!**

**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET  
NEW YORK, N. Y.



RAISE  
YOUR  
SIGHTS!

The output of your machines is  
determined by the quality of  
the cutting tools you use.

**MORSE**

THERE IS A  
DIFFERENCE

**TWIST DRILL AND  
MACHINE COMPANY**  
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. . . . CHICAGO STORE: 570 WEST RANDOLPH ST.

# ALL-OUT PRODUCTION FOR VICTORY

*Dalzen*

THREAD GRINDERS, TAPS and  
BROACHES are speeding  
up production

43"  
WIDE  
39"  
DEEP  
72"  
HIGH

Shown above are some of the  
broaches and taps manufac-  
tured by Dalzen. The broaches  
are made in rounds, flats or  
form. The taps are Whitworth  
and British Association form.

48" WIDE  
38" DEEP  
75" HIGH



The Dalzen No. 1 Thread Grinder will  
grind threads up to ten inches in length  
anywhere on an eighteen inch shaft  
with a diameter maximum of six inches.  
The Dalzen No. 2 grinds threads up to  
four inches in length anywhere on an  
eight inch shaft with a diameter maxi-  
mum of three inches.



## Do much more • take less floor

Today two things are of paramount importance in American  
Industrial Plants: (1) more work, higher speeds and (2) most  
effective utilization of given floor space. Dalzens meet both  
requirements and you can use the saved floor space for added  
equipment or more efficient tool arrangement. Interested in  
more output in less space?

WRITE FOR BULLETINS

# DALZEN TOOL & MFG. CO.

12255 E. 8 Mile Road

Detroit, Mich.



**PATENT  
APPLIED FOR**

Designed by  
Francis E.  
Brady, Jr.,  
Hydraulic  
Engineer.  
Consultant  
to many  
machine  
tool manu-  
facturers.



# *Announcing the New*

## **MODEL 7500 COOLANT PUMPS**

The most adaptable pump of all . . . MODEL 7500 by BRADY-PENROD, INC.! This pump may be made an integral part of any grinder, lathe, cutting or drilling machine or can be easily moved from job to job as needed. A plate adapter is available to fit any tank or base opening. This model is a motor-driven open-impeller centrifugal type, submergible, with an outside discharge. Internal piping is eliminated; external piping reduced to a minimum. This simplification saves engineering and assembly labor.

### **THREE DEPTHS SUITABLE FOR ALL MACHINES**

MODEL 7500 is available with 3 different depths from flange - 4 $\frac{7}{8}$ ", 9", and 15".

Motor capacity -  $\frac{1}{8}$  H.P. to 1 $\frac{1}{2}$  H.P.

Controlled flow - from 4 g.p.m. to 100 g.p.m. with any standard coolant fluid. Suitable for use with abrasives. Special depths available.

Long used as standard equipment by machine tool manufacturers, BRADY-PENROD Pumps (6 other models) are proving their reliability and high hydraulic efficiency in hundreds of locations today. Write or wire for details.

# *Brady-Penrod*

INCORPORATED

1216 W. SECOND STREET  
MUNCIE, INDIANA, U. S. A.

THE TOOL ENGINEER



# Cuts time up to 75%

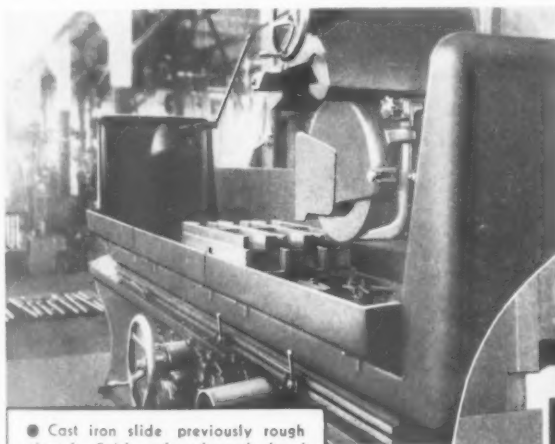
## ON JOBS PREVIOUSLY HAND SCRAPED

**Examples:** Time on pump case reduced from 40 hours to 4 hours . . . . . Time cut from 12 hours to 3½ hours on slide castings . . . . . Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this not only make a big difference in manufacturing cost, but help speed up delivery schedules. To see what Mattison High-Powered, Precision Surface Grinder can do on your work, send us blue prints for production estimates.



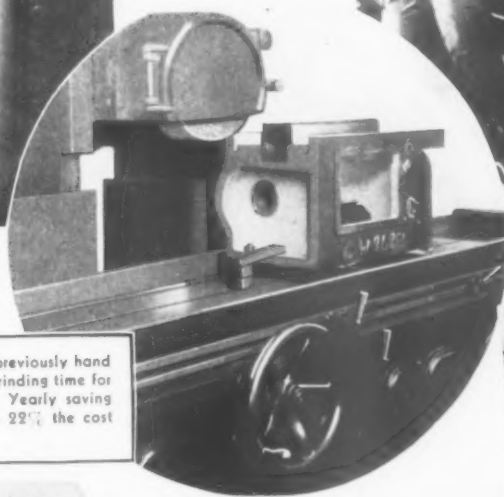
● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".



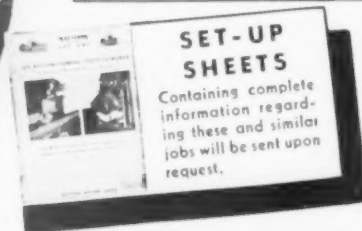
● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 80% savings in time. Finish planing and scraping operations eliminated.



● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.



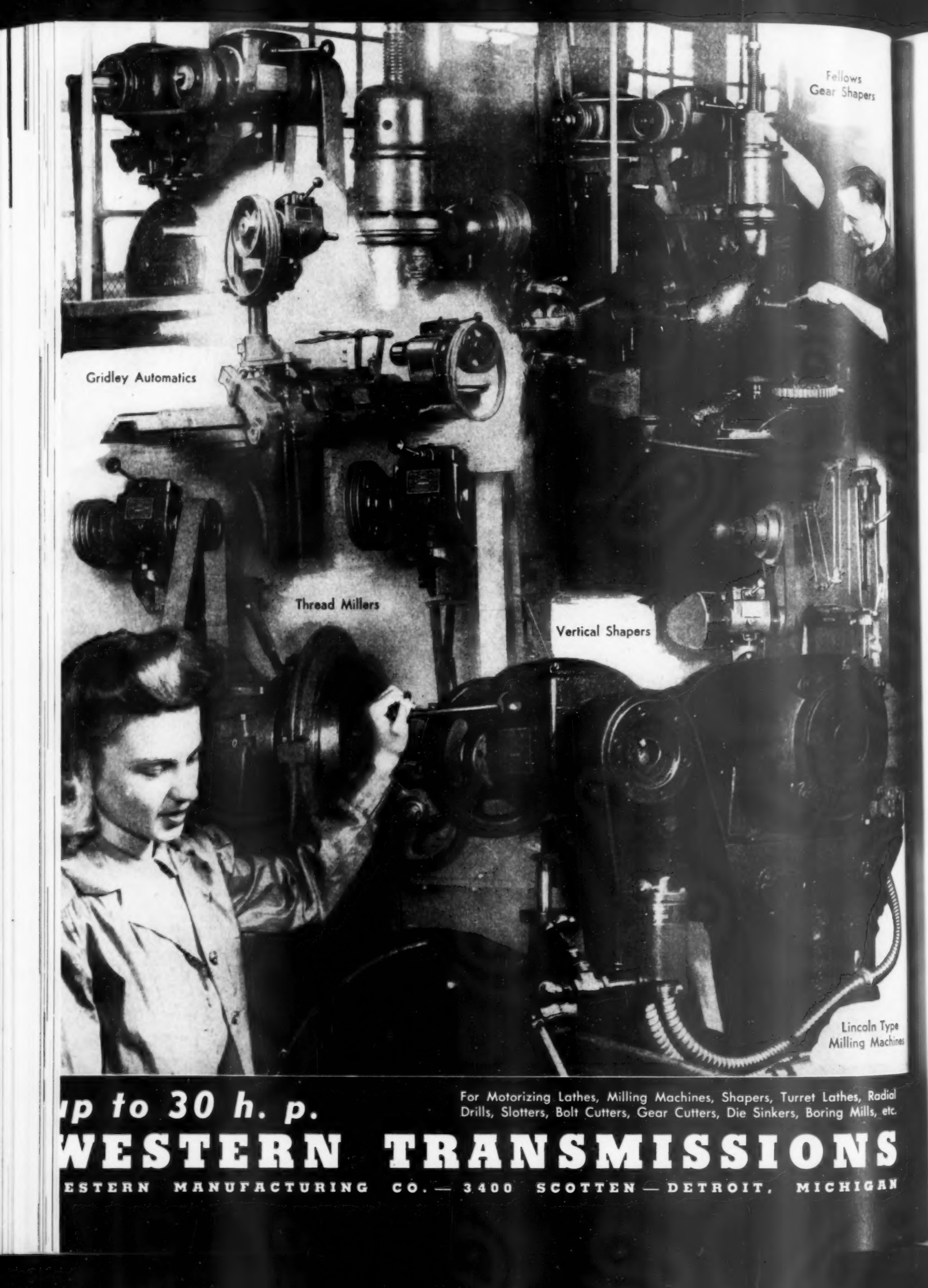
### SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

# MATTISON

# MACHINE WORKS

ROCKFORD • ILLINOIS



Fellows  
Gear Shapers

Gridley Automatics

Thread Millers

Vertical Shapers

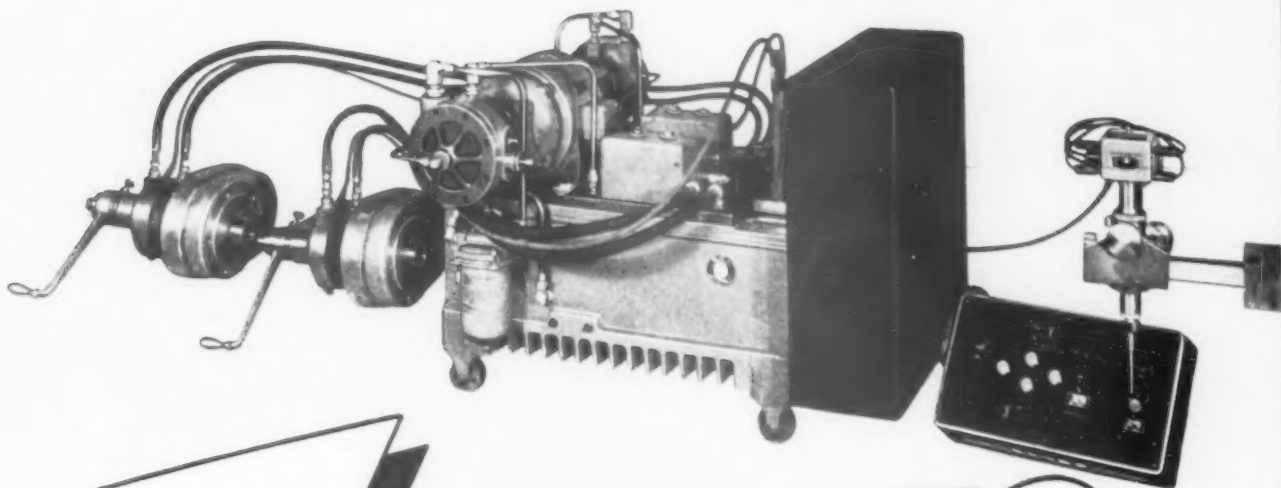
Lincoln Type  
Milling Machines

up to 30 h. p.

**WESTERN TRANSMISSIONS**

WESTERN MANUFACTURING CO. — 3400 SCOTTEN — DETROIT, MICHIGAN

For Motorizing Lathes, Milling Machines, Shapers, Turret Lathes, Radial Drills, Slotters, Bolt Cutters, Gear Cutters, Die Sinkers, Boring Mills, etc.



# 7 TIMES MORE PRODUCTION

from the Machines You're Now Using

## AIRCRAFT ENGINE GEARS

*32 Gears instead of 4 in 16 man hours! That's the increase with DUPLIMATIC in one plant. Smoother finish, less hand finishing and no scrapped work on this tricky contour turning job. Standard engine lathes—with DUPLIMATICS—are now doing the impossible.*



## AIRCRAFT ENGINE CONNECTING RODS

*Automatic contour milling of airplane engine connecting rod cavities. High speeds and increased accuracies possible with DUPLIMATICS have reduced hand finishing. Specially skilled operators are not needed.*

**DUPLIMATICS**—the automatic control for standard machine tools—have established an average increase in production of 7 times the speeds possible with manually controlled machines alone. Accuracies demanded have been easily met; hand finishing has been cut; scrapped parts reduced on all kinds of Ordnance work—

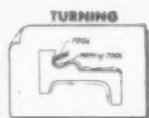
**TORPEDOES • BOMBS • MACHINE GUNS • AIRPLANE ENGINE PARTS  
TANK TURRETS • ANTI-AIRCRAFT GUNS • AIRPLANE LANDING WHEELS**

DUPLIMATICS ARE IN THE LARGEST MASS production plants in America yet their cost is within the reach of smaller production shops.

You use a DUPLIMATIC with your present equipment. It is moved along side any bottleneck machine—engine or turret lathe, shaper, boring mill, vertical mill—and connected up within the space of one day. The following day the operator of that same machine should increase production by 7 times.

(This is the average; we can give you an estimate when you tell us what the work is.)

These sketches indicate some of the automatic contouring that can be done on standard machine tools with DUPLIMATICS.

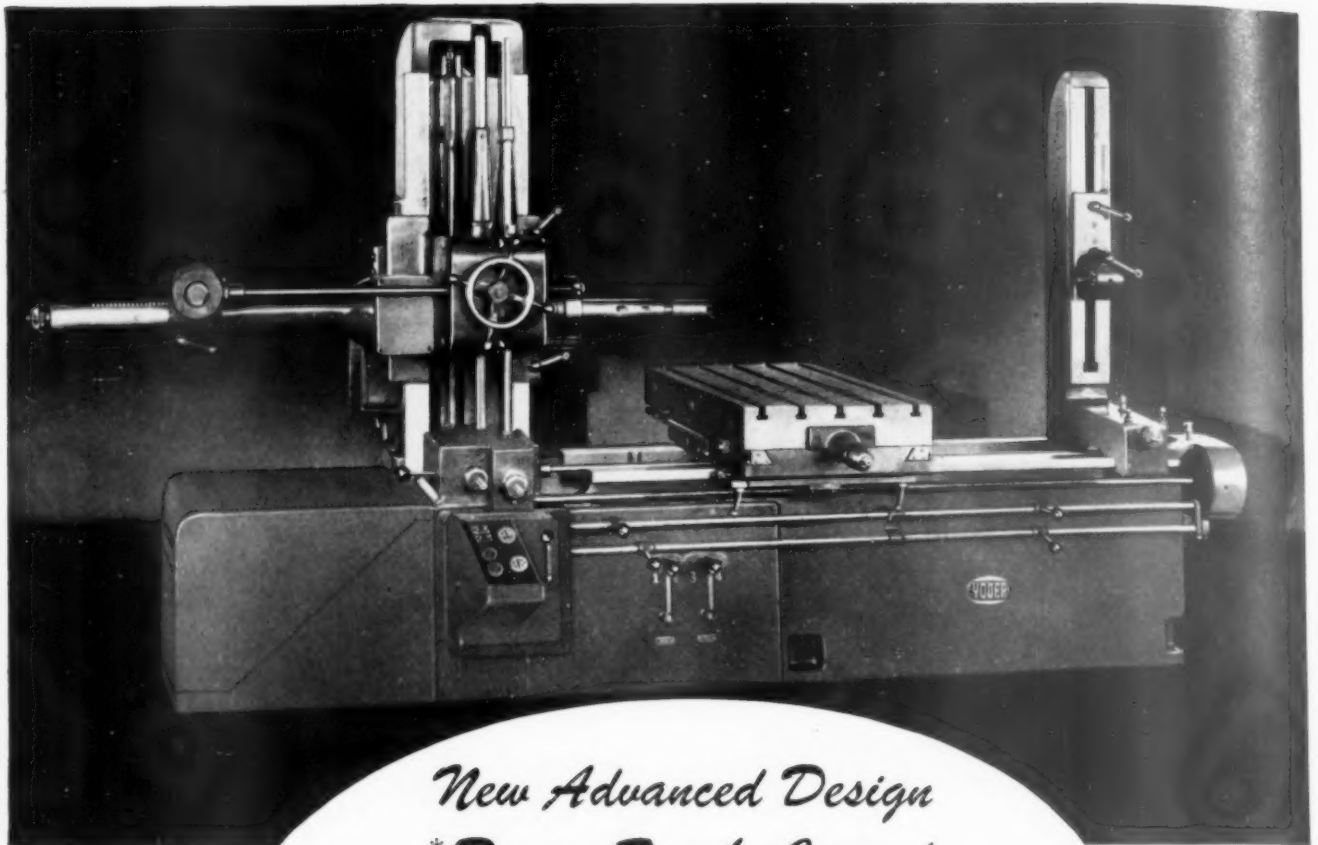


Do your Contour Machining with a DUPLIMATIC and make it AUTOMATIC.

**DETROIT UNIVERSAL DUPLICATOR CO**

212 St. Aubin Ave.

Detroit, Mich.



*New Advanced Design*

*\* Power Touch Control*

# *Yoder* NO. 3A HORIZONTAL BORING MILL

\*POWER TOUCH CONTROL completely meets the demand of war production that EVERY MACHINE BE RUN AT THE MOST PRODUCTIVE OF SPEEDS AT ALL TIMES. Every bit of power can be put on tools, up to the last limit of safety. Feeds and speeds of an infinite variety can flow at the touch of the control hand. That power-flow drive, we call it.

*Read all about this feature and many more in the . . .*



NEW YODER No. 3A Horizontal Boring Mill BULLETIN.



*Yours for the writing!*

*The* **YODER** *SALES COMPANY*  
ENGINEERING MANUFACTURING CLEVELAND, OHIO


YOU GET THE IMPROVEMENTS FIRST FROM YODER

# to help YOU Salvage Your Tool Steel Scrap



Get in the SCRAP for Victory!



This convenient, new Wall Chart was designed  to help your men become familiar with *Spark Testing* as a means of identifying tool steel and checking the major elements present, such as carbon, silicon, molybdenum, manganese, etc. Along with giving the spark characteristics for Carpenter Matched Tool Steels, this large 21"x 30" Wall Chart gives instructions for *Spark Testing*: wheel speeds, effect of wheel grain size, dressing the wheel, etc.

A note on your company letterhead will start this *Spark Testing* "assistant" on its way to you.

**Carpenter**  
**MATCHED**  
**TOOL STEELS**

SEPTEMBER, 1942

**L**et's use *plain logic* as we think about the nation's scrap problem. It isn't enough to search out and sort the tool steel scrap in large plants alone. Or in the smaller plants, either.

Each pound of tool steel scrap in every plant, in every tool room MUST be found quickly and started back along the road to usefulness.

Yes, every pound! Not just "most of it" or "All we can find"—*All of It! Now!*

To help you do the best possible job of collecting and sorting your steel scrap, we offer these suggestions. They are not new or unusual—but if only *one* of them can be put to work in your plant, in your tool room, *more* pounds of vital steel can be put to work right now.

- Make one executive responsible for all scrap salvage. It helps to get results.
- Place ordinary wood boxes near machines and presses, and throughout tool rooms. Mark each plainly for the type of scrap it is to receive.
- Explore odd corners. Get rid of old parts and pieces of steel. Salvage obsolete tools and worn-out machine parts.
- Wherever practical, use Spark Testing as a quick means of separating tool steel scrap. On this page there are suggestions to help you set up a Spark Testing system in your plant.

**TOOL MAKERS** who "know sparks" do not waste valuable time and material by making tools from the wrong steel. This Wall Chart can be the starting place for information on *Spark Testing* to classify tool steels that have lost identity.



The Carpenter Steel Company • 122 Bern Street • Reading, Pa.

# Greenlee

# AUTOMATIC NEWS

PREPARED BY GREENLEE BROS. & CO., ROCKFORD, ILL.

## PRODUCTION OF BOLT SPEEDED UP BY USE OF FORM TURNING ATTACHMENT

Greenlee 1 $\frac{5}{8}$ " Automatic Turns Out 36 Parts Per Hour

Today the manufacturer using automatic screw machines in the production of the vital munition parts needed for our war effort, can be sure of getting maximum production from his machines by using only the most efficient tooling set up possible for each particular job.

This story of the production, on a 1 $\frac{5}{8}$ " Six-spindle Greenlee Automatic Screw Machine, of a connecting rod bolt for an airplane engine, is an excellent example of planning the most efficient tooling to obtain the greatest production possible.

### Form Turning Attachment For Turning Long Length

The problem encountered in the production of this connecting rod bolt was that of turning a long length in as few positions as possible to obtain the maximum production. To solve this production problem, a form turning attachment was used which permitted the part to be completely rough turned in two positions and still maintain the short stroke of 1 $\frac{1}{8}$  inches necessary to get a production of 36 pieces per hour.

If the form turning attachment had not been incorporated in the tooling set-up for this part, the production would have been considerably less than it was, since a longer tool slide stroke would have been required to permit the rough and finish turning operations that the finish of this part required.

### Production Time Cycle 100 Seconds

The production time cycle for this connecting rod bolt, made from 1 $\frac{1}{16}$ " square A.M.S. 6310 steel is 100 seconds, or 36 per

hour. The spindle speed is 166 R.P.M., resulting in 42 S.F.M. The tool slide feed is .0042 inches per revolution.

### Sequence of Operations

In the first position the stock is broken down for the form turning operation, and the thread diameter is rough turned with the roller turner.

In the second position the square section is turned with the form turning attachment, the thread diameter is finish turned, and the end is faced.

In the third position the piece is rough formed under the head, the .365 front bearing diameter is finish turned, and the end is chamfered for the thread.

In the fourth position the relief section in back of the thread and the tapered section of the front bearing diameter is formed. The second relief diameter and the second bearing diameter are rough turned in this position with a knee turner ahead of the roller support. The piece is supported on the previously turned thread diameter.

In the fifth position the piece is faced under the head, and the rear bearing diameter and the rear relief diameter are formed. The piece is again supported on the previously turned thread diameter.

In the sixth position the piece is supported and then cut off.

### TO HELP YOU

Greenlee Bros. & Co. hopes that the performance data and production stories of jobs now being run on Greenlee Machines presented in these advertisements will be of some help to the metal-working industry in obtaining more efficient screw machine production.

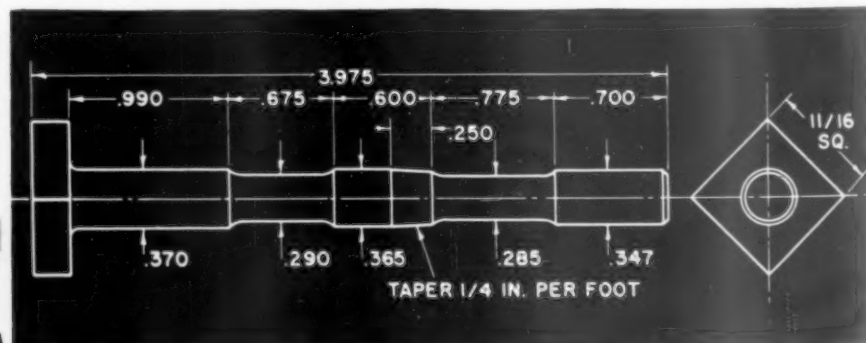


Shown above is a view of the set-up for the production of this part, showing the first, second, and third positions. The photograph was taken just after the machine was indexed and does not show completed operations at the various positions. The form turning attachment described in this story is shown in the second position.



The photograph shown here was taken from the rear of the machine and shows the tooling set-up for this job in the fourth, fifth, and sixth positions.

**Greenlee**  
BROS. & CO.  
ROCKFORD ILLINOIS U.S.A.



MULTIPLE-SPINDLE DRILLING, BORING, AND TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AIRCRAFT PRODUCTION MACHINERY

# This War is a Production Race

You and your tools are  
deciding this war.

It's  
PRODUCTION  
for  
VICTORY

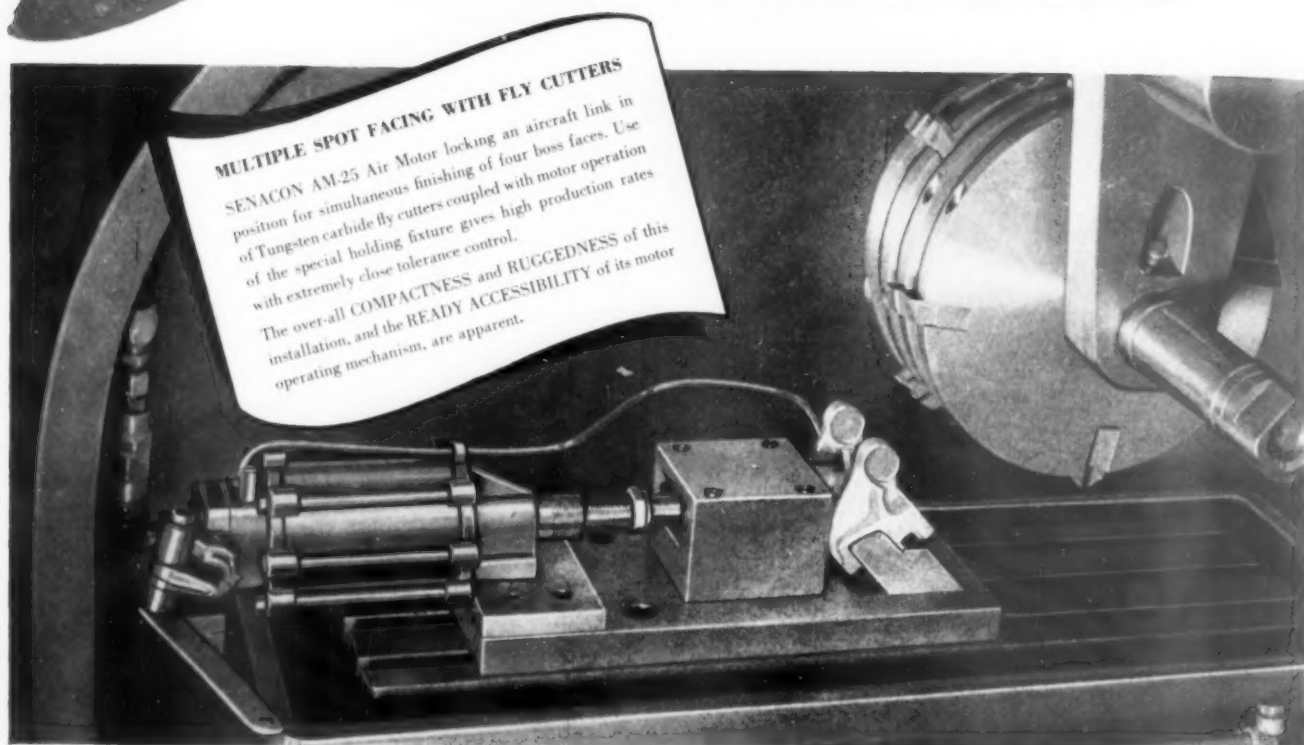
DAVIS BORING  
TOOL DIVISION  
LARKIN PACKER CO.  
ST. LOUIS, U. S. A.

**DAVIS**  
BORING TOOLS



**TOUGH FIXTURE PROBLEMS MADE EASY**  
with

# **Senacon** **AIR MOTORS**



**Tool Engineers Everywhere Are Finding These Versatile Power Units Indispensable in the Design of Specialized High Duty Fixtures**

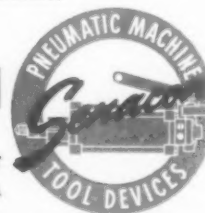
**C**OMPACTNESS, flexibility and ease of control are inherent characteristics of the exclusive INTEGRAL valve construction of SENACON Air Motors.

These features are particularly valuable in the design of power fixtures which move with the main machine tool, such as holding fixtures for milling machine operations. In such installations the single air line connections, finger tip valve accessibility, and all around compactness of the SENACON Air Motor are particularly appreciated by the tool engineer. Hundreds of SENACON motors are in daily use giving outstanding service on specialized installations of this character.

**SENACON POWERED fixtures are high production fixtures.** Every tool designer should be familiar with the possibilities offered by this extremely versatile tool. Write for our new catalog showing typical examples of SENACON Air Motors solving intricate tooling problems.

**SMITH - JOHNSON**  
CORPORATION

623 EAST TWELFTH STREET  
LOS ANGELES, CALIFORNIA



**SPEED PRODUCTION WITH AIR POWER**

# WHEN PRECISION COUNTS



## USERS OF HARD CHROME PLATE ASK FOR PROPER HEAT TREATMENT

Are you getting proper heat treatment when you specify hard chrome plate for surfacing new parts, or salvaging old ones?

Proper heat treatment, before plating, relieves the stresses usually present in tool and machine steels. And heat treatment, after plating, minimizes the occluded hydrogen and prepares the part for the final grinding operation.

Proper heat treatment is one of the many concrete advantages in the plating service offered you by Hartford Chrome.

If you want to discuss the successful application and use of hard chrome plate on your own product, a request on your letterhead will bring a service engineer from Hartford Chrome, without obligation.



The WPB says, "SALVAGE OLD PARTS, SAVE  
NEW PARTS WITH HARD CHROME PLATE"

## HARTFORD CHROME CORPORATION

525 PARK ST.  
HARTFORD  
CONN.



SERVING  
NEW ENGLAND  
AND NEW YORK

Licensed by United Chromium, Inc.



# *There's a real "KNOW HOW" in*

## **CORRECT BROACH DESIGN**



*...and* **DETROIT BROACH  
ENGINEERS HAVE THE NECESSARY KNOWLEDGE  
AND EXPERIENCE TO HELP YOU**

All the men you see here are experts in designing broaches and broach accessories. That's their only job.

When these men design broaches for you, you save time. The job goes straight from the drawing-board into production. There's no waste in high speed steel, because the broach is designed exactly for the job for which it is intended. You save money, because these men have the "know-how" to do the job right the first time. And there's a decided saving in man-hours, as Detroit Broach engineers can do the work faster, more efficiently.

All you have to do is send us a print of the part you want broached—and tell us the type of machine on which the broach is to be used. These men will go right to work.

Remember, correct broach design means greater efficiency—faster production—lower costs. Let Detroit Broach engineers help you at every stage of your broaching operations—starting with broach design.

**DETROIT BROACH COMPANY**  
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

# 94 minute operation cut to 17 MINUTES!

## on a FOSTER FASTERMATIC Automatic Turret Lathe

● The application of a Foster Fastermatic Automatic Turret Lathe to machining Airplane Engine Crankcase Sections cut a 94-minute operation to 17 minutes.

The machine is shown with tools set up for automatically handling 6 operations, including turning, boring, facing, taper turning, grooving and chamfering. Rough and finish cuts were taken on all surfaces, and close tolerances maintained. Floor-to-floor time is now 17 minutes per piece.

Foster Fastermatics are universal, automatic turret lathes designed for accurate, high production machining. They may also be applied very effectively to comparatively small lot work. The machine is powered with a hydraulic feed system, with automatic or hand controls that are flexible, simple and convenient. Speed changes are automatically made by hydraulically-operated clutches, and may be made at any time during the cut or forward rapid traverse.

In addition, several speed changes may be made for each face of the turret, as required by the work. An infinite number of feeds are provided by the hydraulic system, and the rate of feed desired is also automatically controlled by cams for each operation. Due to the fact that the entire machining cycle is automatic, the machine is a pace setter, and can be arranged for the most efficient operation, and for the greatest length of tool life.

It is possible that Foster Fastermatics would improve your production and efficiency in handling your machining operations. Foster Engineers will be glad to check over your chucking machine problems and make their recommendations. This service is rendered without obligation.



**FREE** Write for the new "Fastermatic" Catalog. Learn about the outstanding time-saving features of these highly productive, automatic "Fastermatic" Turret Lathes. Write to Foster Division, 1104 Beardsley Ave., Elkhart, Ind.

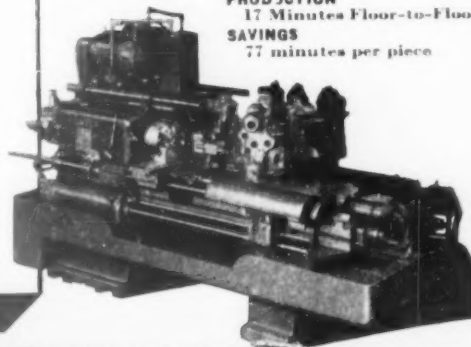


### FASTERMATIC DATA

<b>MATERIAL</b> —Aluminum	
<b>DIMENSIONS</b> —Outside Diameter	21.500"
Inside Flange	18.120"
Flanged Groove	19.316"
	19.310"
Taper 1 dg. 7 mins.	1.870" lg.
Bore	4.750"
Hub Diameter	9.320"

<b>HOLDING METHOD</b> —Special Fixture	
<b>SPEEDS</b> —All 6 Operations	72 r.p.m.
<b>FEEDS</b> —All 6 Operations	.008"

<b>PRODUCTION</b>	
17 Minutes Floor-to-Floor	
<b>SAVINGS</b>	
77 minutes per piece	



## INTERNATIONAL MACHINE TOOL CORPORATION

FOSTER DIVISION, ELKHART, INDIANA • LIBBY DIVISION, INDIANAPOLIS, INDIANA

MAIN OFFICE AT ELKHART, INDIANA

FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS

# Another Tribute To The Super Smooth Finish and Accuracy of **SUNNEN PRECISION HONING**

● To aid them in living up to their slogan of "It Must Be Right," the Hydraulic Press Manufacturing Company has adopted Sunnen Precision Honing.

Replacing hand reaming, the Sunnen method not only saves time, but, in addition, makes possible close tolerances and a super-smooth finish.

## You, Too, Can Profit by These Advantages—

If you are reaming or grinding internal cylindrical surfaces from .185" to 2.400" in diameter, this practical, inexpensive, accurate machine will help you speed up production, cut costs, and improve accuracy.

The Sunnen Precision Honing Machine does not require skilled labor—workers in "teens" can handle jobs in "tenths." Can be set up and work located in less than a minute. Accuracy within .0001" guaranteed. Corrects errors of out-of-roundness or taper caused by previous operations. Relieves big internal grinders for other jobs. Doesn't need fixtures—work is held in hand by operator. Provides simple, low-cost method for duplicating sizes.

Put Sunnen Precision Honing to work in your plant.

**SUNNEN PRODUCTS COMPANY**  
7932 Manchester Avenue St. Louis, Missouri  
Canadian Factory: Chatham, Ontario



**SUNNEN**

## Send for FREE BULLETIN

—giving complete information. Or, if you prefer, a Sunnen Sales Engineer will demonstrate this equipment in your plant on your job.

To insure interchangeability of parts, we use Sunnen honing on our HYDRO-POWER Valves and Control Bodies.

— The Hydraulic Press Manufacturing Co.

The Sunnen Precision Honing Machine puts the finishing touch on internal bores of valve and control bodies, assuring a fine finish with holes that are straight and true.



Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.



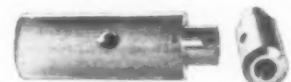
Aircraft Valve Tappet Roller. 4-Micro finish.



Airplane Engine Parts accurately honed to a super-smooth finish.



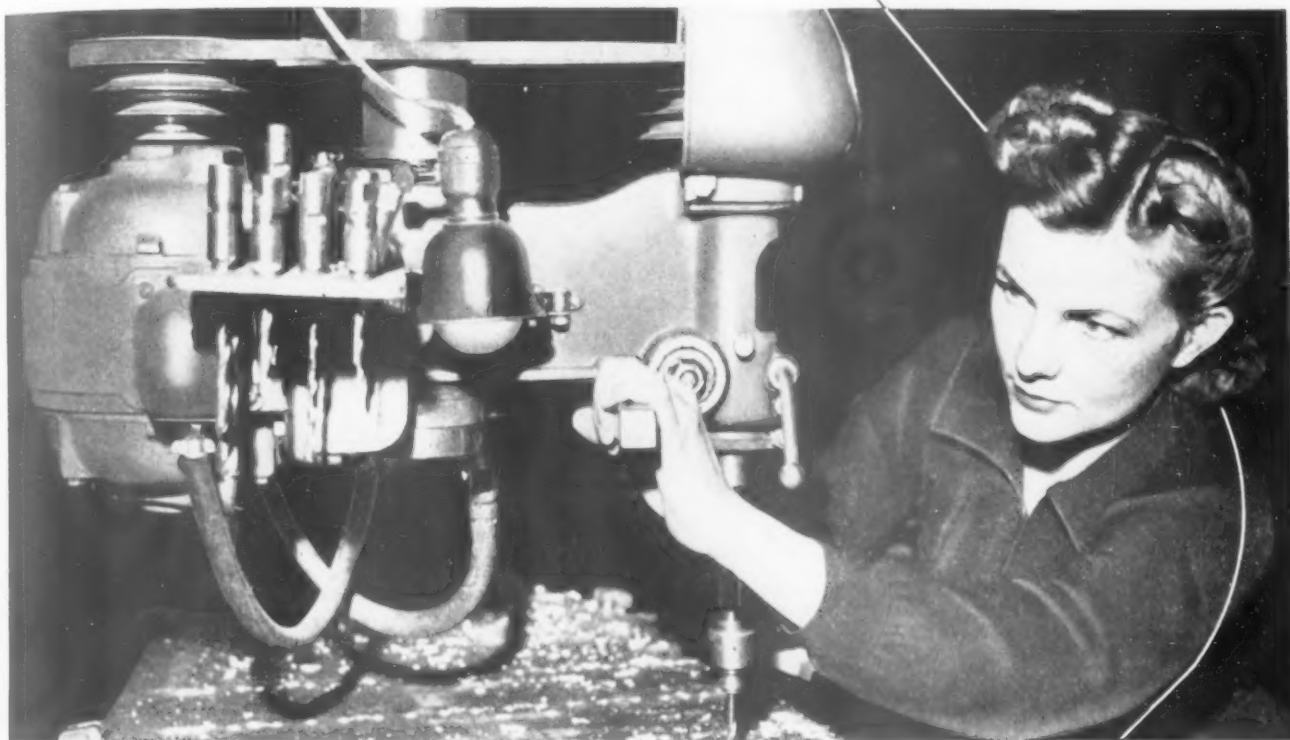
Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 in."

# LIKE A DUCK TO WATER

## WOMEN and unskilled operators take to these machines



AND here's the proof: Reports from shop superintendents and managers in plants (*names on request*) using Delta Drill Presses, Grinders, Saws and Cut-Off Machines read: "... unskilled operators can be used successfully due to the accuracy and perfect balance of Delta machines." "... with standard Delta Drill Presses we have built a special machine that enables us to use unskilled labor on an extremely difficult operation—thus freeing skilled mechanics for more difficult work." "... the training time and breaking in period have been considerably reduced with Delta machines—thus permitting us to take better advantage of unskilled labor." "... they are safer to operate, are more accurate and are built with precision balance, so we can use unskilled operators on most jobs ..."

### DELTA DESIGN Always Offers These Advantages

Low First Cost  
Low Maintenance Cost  
Economical Operation  
Reduced Labor Costs  
Greater Flexibility  
Portability

The complete DELTA-Milwaukee line consists of low-cost, high-quality Drill Presses, Cut-Off Machines, Grinders, Abrasive Finishing Machines, Saws, Lathes, Jointers and Shapers.



**SEND FOR FREE "TOOLING TIPS"**  
Write for this practical shop bulletin showing how other manufacturers are taking advantage of the many features of DELTA-Milwaukee machines. Also for latest complete catalog. The Delta Mfg. Co., 610-K E. Vienna Ave., Milwaukee, Wis.

# HOW TO GET THE MOST OUT OF YOUR LATHES

*No. 1 in a series of suggestions made by the South Bend Lathe Works in the interest of more efficient war production.*

## Keep Your Lathes Clean

Yes, it's as simple as that. Just by keeping your lathes (and other machine tools) clean, you can increase production, reduce scrap, and lengthen the life of your equipment.

This will not only benefit you, but it will be a definite contribution to our total war effort. For every available machine tool must be kept going. The combined output of all machine tool builders cannot supply enough equipment to keep pace with the rapidly expanding war production program, so there can be no unnecessary replacements.

### Dirt Is Abrasive

Unless brushed away frequently, the scale, grit and fine chips produced by the cutting tool mix with the oil on the bed ways, dovetails and other bearing surfaces, forming a dirty sludge. Because this dirt is abrasive, it increases friction and causes wear wherever it is allowed to collect.

Obviously, this retards production, shortens machine life, and makes it hard for the operator to maintain exacting tolerances. And when chips work under the tailstock or saddle, or into the spindle taper, the accuracy of the lathe may be seriously impaired.

### Encourage the Operator

A good way to keep your lathes clean is to encourage each operator to take care of his own machine. Let him know that you appreciate his interest and effort. Explain how easy it is to spot a good machinist by the way he takes care of his lathe. Urge him to take pride in keeping his lathe clean, free from dirt and chips. He will have greater respect for his job and will unconsciously become a more careful workman.

A small paint brush is convenient



*A small paint brush is convenient for brushing away dirt and chips*

for brushing away loose dirt and chips. Compressed air is not so good because it may blow dirt and chips into oil holes and bearings. Pliers are handy for pulling long steel shavings away from the machine. A clean cloth can be used, after brushing, to remove the last traces of dust and grit. A little oil on the cloth will prevent rust from forming on the finished surfaces of the machine.

The felt wipers on the ends of the saddle wings should be removed and cleaned in kerosene occasionally. An experienced machine tool service man should periodically inspect the lathe and remove any grit or chips that may have worked under the saddle or tailstock. The bed ways can be badly scored by a small steel chip imbedded in the saddle or tailstock base.

### Don't Let Chips Collect

Adequate chip disposal should be

provided to prevent chips from piling up underneath or around the lathe. Dirt and chips should not be allowed to work into the threads of the lead screw or the gearing of the apron or quick change gear box.

At a time like this, when most machine tools are operating 24 hours a day at speeds and feeds far beyond those for which they were designed, a small amount of carelessness may cause excessive wear—even a breakdown. Certainly an ounce of prevention is now worth far more than a pound of cure.

### Write for Bulletin H1

Bulletin H1 giving more detailed information on the cleaning and care of the lathe will be supplied on request. Reprints of this and other advertisements in this series can also be furnished. State number of copies wanted.



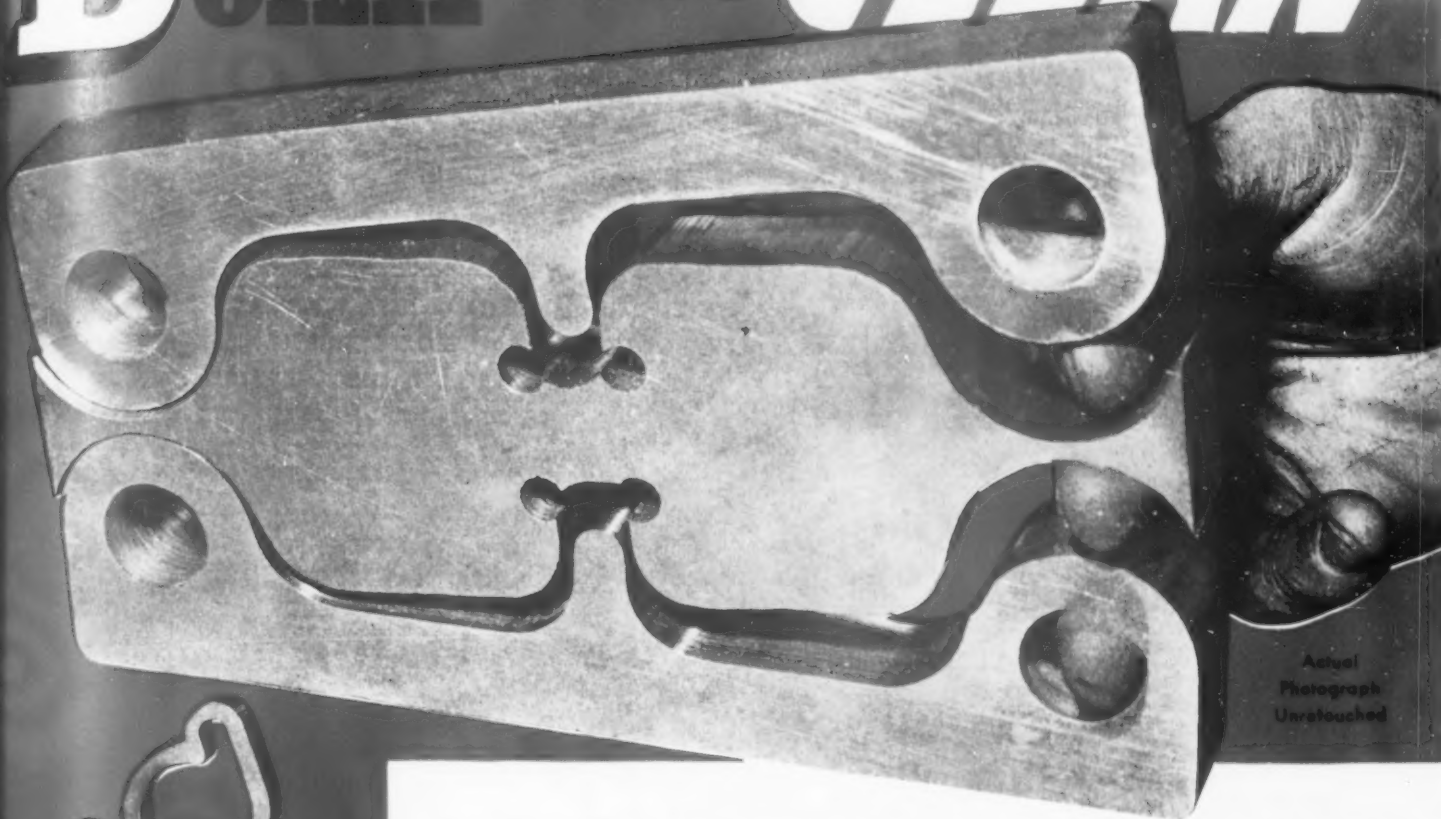
**SOUTH BEND LATHE WORKS**

Dept. 926

• South Bend, Ind., U. S. A. •

Lathe Builders for 35 Years

# DoAll cuts CLEAN



## NO FINISHING IS NECESSARY

That's right—on the DoAll you can cut out thousands of metal parts and they're all **ready for use**. Follow the line of any external or internal design and get a smooth finish that requires **no further machining**.

## UNSURPASSED FOR RAPID, ECONOMICAL PRECISION SAWING

Whether it's special parts or regular production work — 20 to 80 stacked sheets, bar or tubing stock, blocks of any thickness — the DoAll saves uncountable man hours and much valuable machine time.

DoAll supremacy is aided by the 48 different saw bands available — a best style for every kind of metal or alloy.

Then, consider the metal saved — very important today. DoAll leaves waste metal in large, usable pieces, not in a heap of filings or nibbled chips.

LET US PROVE THESE FACTS TO YOU. A factory-trained man will call with a DoAll and show you how it will save you time, labor and metal.

**New Illustrated Book** — The story of DoAll performance in many plants, told in pictures. Send for copy.

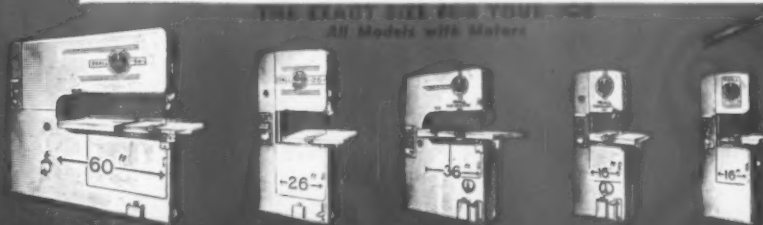
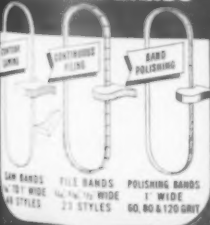
## CONTINENTAL MACHINES, INC.

1304 S. Washington Ave., Minneapolis, Minn.

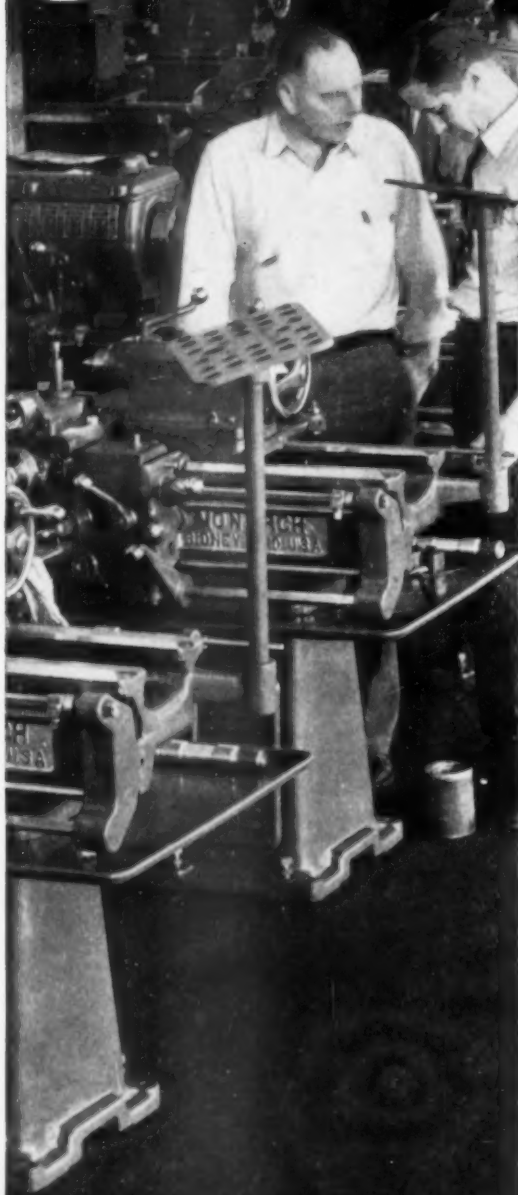
Associated with the DoAll Company, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.



### THE "DoAll" USES 3 KINDS OF BANDS



# Saved-15 LATHES!



**T**WO PLANTS converting to war production were buying new lathes. One wanted 25 Monarchs, the other, 18.

But—other plants needed new lathes, too. Needed them badly. Decreasing these two orders would not only permit faster delivery, but would save lathes for other users.

Our technical field men studied production methods and schedules. They found that by taking full advantage of Monarch's wide utility and timesaving features, 18 lathes would do the work in one plant, and 10 in the other. Result—15 Monarchs made available for other producers.

Such incidents are common in the work of Monarch Engineers. They know that Monarchs can do more work than is usually set up for them . . . that Monarchs' power and rigidity enable them to take the severe service demanded today, without flinching, with no letdown in dependability and accuracy.

Even with 1942 production twice that of 1941, and four times that of 1940, Monarch lathes continue to maintain their unvarying quality.

THE MONARCH MACHINE TOOL CO. • • • SIDNEY • OHIO

**MONARCH**  **LATHES**  
COVER THE TURNING FIELD

# STELLITE 98M2 METAL-CUTTING TOOLS

## *For Machining Steel . . . Available for Immediate Deliveries . . .*

Stellite 98M2 tools are made of a cobalt-chromium-tungsten alloy especially designed to increase the speed of machining steel. Developed by Haynes Stellite Company and Union Carbide and Carbon Research Laboratories, Inc., Units of Union Carbide and Carbon Corporation, this new alloy represents another achievement in the production of non-ferrous alloy cutting tools.

**Tested on War Production**—Stellite 98M2 tools have been thoroughly tested in the machining of many types of steel parts needed in the war program and are now being used for a wide variety of operations on such parts. Specific operations for which Stellite 98M2 alloy tools have proved especially suitable include turning, facing, boring, grooving, and forming of all types of steel.

**High Rates of Metal Removal**—These tools have proved that they will machine steel at even higher cutting speeds than Stellite Star J-Metal tools or Stellite "2400" tools, and with longer life between grinds. With the new tools, heavy roughing cuts can be taken with coarse

feeds—and to get high rates of metal removal—yet tool life is long and economical, for this new alloy has an *unusually favorable balance of red hardness, edge strength, and toughness.*

**Available Forms**—Stellite 98M2 tools are furnished as standard square and rectangular tool bits and welded-tip tools. Many sizes and types are available for immediate delivery. In addition, Haynes Stellite Company is prepared to furnish special tools made of this alloy, cast and ground to customers' specifications.



Send for this new descriptive price list. It will help you select the sizes and styles of Stellite 98M2 Metal Cutting Tools you require.



## HAYNES STELLITE COMPANY

*Unit of Union Carbide and Carbon Corporation*

New York, N. Y.



Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

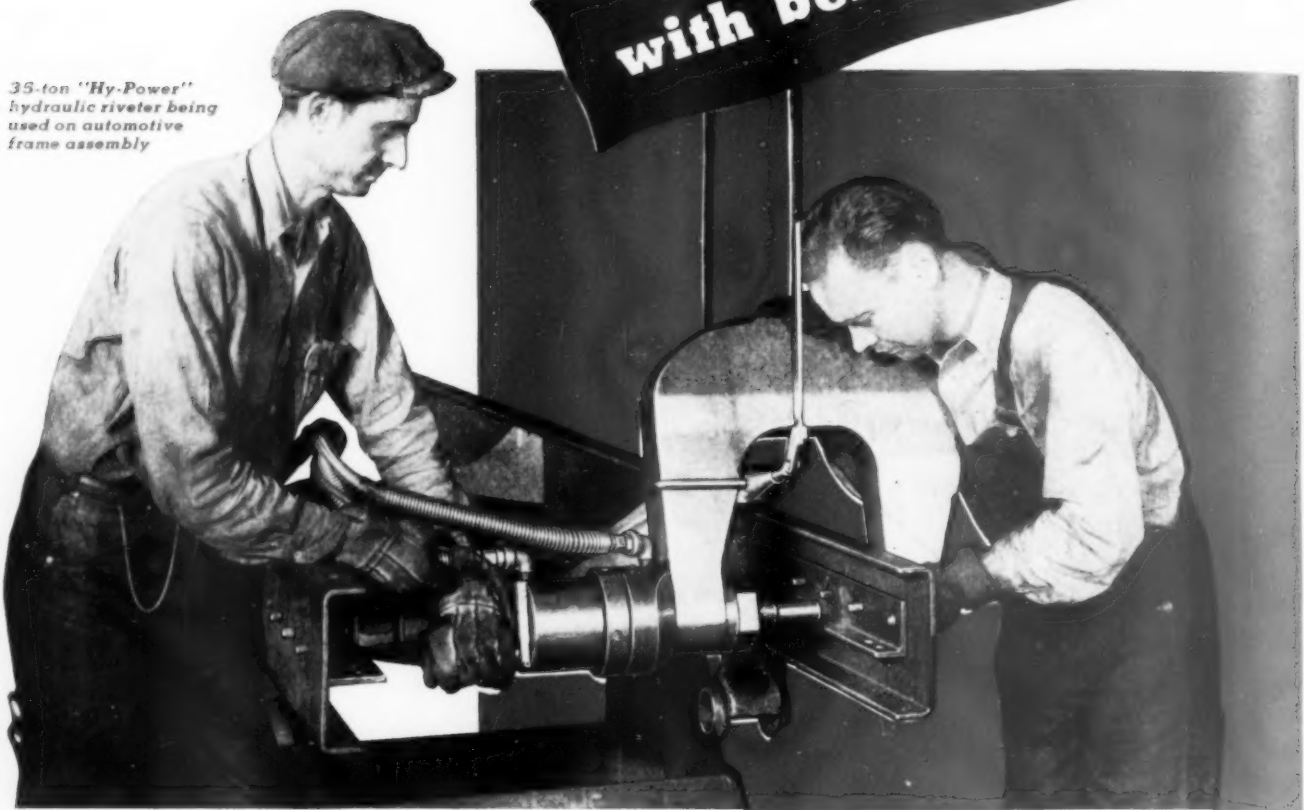
The words "Haynes Stellite," and "Stellite" are registered trade-marks of Haynes Stellite Company

SEPTEMBER, 1942

# "Bang 'em out..."

with better quality

35-ton "Hy-Power"  
hydraulic riveter being  
used on automotive  
frame assembly



**S**PEED in production doesn't mean any relaxing of American standards of quality and precision. On the contrary, new records for speed and quality are being set on thousands of jobs all across the country.

Hannifin "Hy-Power" hydraulic riveting equipment is doing its part. This riveting method is so fast that it almost has to be seen to be believed; so easy to handle that you will want to try it yourself. The standard 17½ ton "Hy-Power" portable unit for heading ¾ inch cold rivets has an operating cycle of 2½ seconds. Speed of other units ranges from 1½ to 3 seconds, with 3 to 4 inch stroke. Operation is quiet, reducing operator fatigue.

Extensive tests have demonstrated that the hydraulic squeeze riveting action not only forms a perfect head, but spreads the rivet body to fill the hole better and tighter than is done by other riveting methods. Ample

maximum pressures under full control, and the characteristics of hydraulic operation insure tight and uniform rivet application. There is also an automatic compensation for variation in rivet length, within the capacity of the unit.

The exclusive "Hy-Power" riveting cycle is push-button controlled, and includes: 1. Rapid advance stroke; 2. Automatic high pressure working stroke; 3. Automatic reversal at maximum pressure; 4. Rapid return stroke. The "Hy-Power" pressure generator idles at zero pressure between cycles.

This faster and better riveting is being used on automotive frame production, railroad cars, structural work, and armament. Similar equipment is being used for press-fit assembly operations, punching, and other work involving the application of pressure. Perhaps there is an idea here for you. Write for "Hy-Power" bulletin 53, or consult Hannifin engineers for specific recommendations.

**HANNIFIN**  
MANUFACTURING COMPANY  
621-631 So. Kolmar Ave., Chicago, Ill.

Detroit Representative: R. A. BEAN, Hayward Building, 4829 Woodward Avenue • Telephone Columbia 4949

**HANNIFIN** *hy-power*  
RIVETERS ★ PUNCHES ★ PRESSES

# THE TOOL ENGINEER

T.M. Reg. U.S. Pat. Office

SEPTEMBER, 1942

Volume XI, Number 9

## DETROIT

"THE news from Detroit is bad this summer," began a much discussed picture magazine article. A million men and women who never saw a production line read that strikes, poor planning at the top and poor housing have jeopardized war production.

The news is bad—for the Axis. The government has stated flatly that Detroit already is turning out one-sixth of this country's total volume of arms. This has brought stresses and strains. Adolescent unions, uncontrolled by government, are cocky with their paychecks. Occasionally, like Federal projects, they forget who they work for. Management often rushes back to the plant after supper to work out problems of materials shortages. And sometimes three hours sleep is not enough. Thousands of "immigrants" find accommodations but little better than the share-croppers shacks they left. And now and then, Detroit is as hesitant about settling arguments as the Administration, six months before election.

Detroit's men and machines are not a god-like combination. But they have passed what looks like a miracle in exceeding almost every quota, in filling ever-lengthening trainloads of military material.

Rather than worry about hypothetically lost production in this city, the nation might better be concerned with maintaining a flow of raw materials and tools to Michigan sufficient for industry there to continue its production pace.

The picture magazine story is based on the time-worn tabloid formula: yell first, yell loudest and change the subject in the next issue. A suggestion? Why can't the rest of America produce more than five times the goods flowing from one city.

## "GREENIES"

IT has been estimated that the war labor force will be expanded to 15,000,000 persons by the end of 1942, to 23,000,000 during the year following. Where will these millions of additional workers come from? They must come from the homes of the nation. In the last war 25 per cent of all factory workers were women. Production already has passed the 1918 peak, yet only 10 per cent of the workers in our arms plants today are women.

Womens' war work questionnaires flooding the United States Employment Service offices show that millions of "Greenies" are ready to take their places on the production front. Are Tool Engineers ready to put them to work?

Henry Ford, mass production genius, who has long barred women except those with dependents from his

factories admitted on his 79th birthday a few weeks ago that women are doing a job in his giant bomber plant. In a Springfield, Vermont, defense training school housewives are learning to master the use of the micrometer in one day. Charles Kettering has said that a woman can understand anything that a man can explain.

Admitting that women can do the job is not enough. Tool Engineers must prepare now—not later—to put millions of women to work. If they haven't planned or started a program for training and conditioning women for the world of machinery, American women may never get the opportunity to do the work that will shove Herr Shickelgruber behind the eight ball.

## MEETING

NEXT month, a meeting will be held in Springfield, Massachusetts that can tremendously affect the nation's course. It will be a meeting of the high command of the production front.

At Springfield, birthplace of the Springfield rifle, part of the New England community where was born American liberty and industry, the American Society of Tool Engineers will hold a War Production Conference. From there, as certainly as from Washington, London and Melbourne, will come ideas which will produce victory for freedom-loving men and women.

Any one of these ideas may shorten the war. A Springfield get-together may produce another hundred planes a month. Delivered to the right battlefront at the right time, they can strike the decisive blow for liberty.

## SCRAP

TO date, contributors to the nation's salvage for victory drives have been asked to contribute nothing which would interfere with normal routine. In the next few months that picture must change. Before the year's end, 68,000,000 tons of scrap must be returned to production. (In 1918, peak production year of the last war, requirements were a paltry 26,800,000 tons). Between 75 and 80 percent of the nation's scrap must come from industry.

Every man who influences production must redouble his efforts at salvage. Every Tool Engineer must keep SCRAP on his daily list of jobs to be studied. German engineers are not asked to collect scrap. Hitler has confiscated all unused iron and steel in the Reich, including finished castings and spare parts. His order is being enforced by Heinrich Himmler, Gestapo Chief. This country needs no Himmler to see that scrap is gathered. America is in the war to end such methods.

ROY T. BRAMSON, Editor and Publisher    JEROME S. WILFORD, Managing Editor    ANDREW E. RYLANDER, Technical Editor  
WALLACE A. SCOTTEN, RALPH E. DAVIS, ALBERT C. COCHRANE, Associate Editors

SEPTEMBER, 1942

63

# Tool Conservation begins in the Tool Crib



This is one of a series of messages on the importance of proper handling of tools in the Tool Crib

Photograph—Courtesy General Electric Company, Philadelphia

**L**ONG, efficient tool life may be as much due to care in receiving, storing and handling in the Tool Crib as to proper use *out* on the job.

Here is an example of a carefully thought-out tool crib arrangement that pays substantial dividends to its plant in dollars and time saved. After use each Tap is carefully wiped clean of grit and chips before

being restored to its proper place. The shank is placed in its individual recess, leaving the cutting edges free from chance blunting or chipping against other Taps.

This arrangement takes into consideration the size, shape and physical peculiarities of these tools to insure safety of storage, speed of locating and ease of handling.

## GREENFIELD TAP AND DIE CORPORATION GREENFIELD • MASSACHUSETTS

DETROIT PLANT: 5850 Second Boulevard  
WAREHOUSES in New York, Chicago and Los Angeles  
In Canada: GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.



TAPS • DIES • GAGES • TWIST DRILLS • REAMERS • SCREW PLATES • PIPE TOOLS

# High Speed Film Catches Machine Tool Action

L. T. WELLER

WORKS LABORATORY  
GENERAL ELECTRIC COMPANY

IN AN effort to learn what takes place at the cutting edge of a machine tool when cutting metal at normal speed, the engineering department and Works Laboratory of the General Electric Company have utilized high-speed photography with interesting results. The views were photographed at 1000 frames per second. The film caught the action, magnified it, and slowed it down to 1/60th normal speed, making possible a detailed study of the action.

For the first experiments, planing and milling machines were used to cut cast iron, brass, and mild steel. Chip action as influenced by rake and clearance angles was observed to determine correct cutting action and any irregular cutting action that might result from improperly ground tools. The work piece was in the shape of an angle iron, chosen for its easy control of the chip and because it allowed the camera to be focused on the best view of the chip.

Squares 1/32" apart were inscribed on the block of metal so that the chip distortion could be identified and also to show approximately how much metal was taken off in a cut.

## Rake Angle

The degree of rake angle determines the kind of compression which will result. When machining steel, a blunt rake angle of 16 degrees crushes the chip and the cross grain areas marked on the block are in the shape of oblongs instead of the original squares. With a greater rake angle of 24 degrees, the chip is rolled up with less crushing action and the areas remain approximately as square as on the chip. The chip flow is much smoother, also.

In the case of brass, the chips are compressed into wedge-shaped pieces at the bottom, and are thrown clear of the cut by the milling cutter.

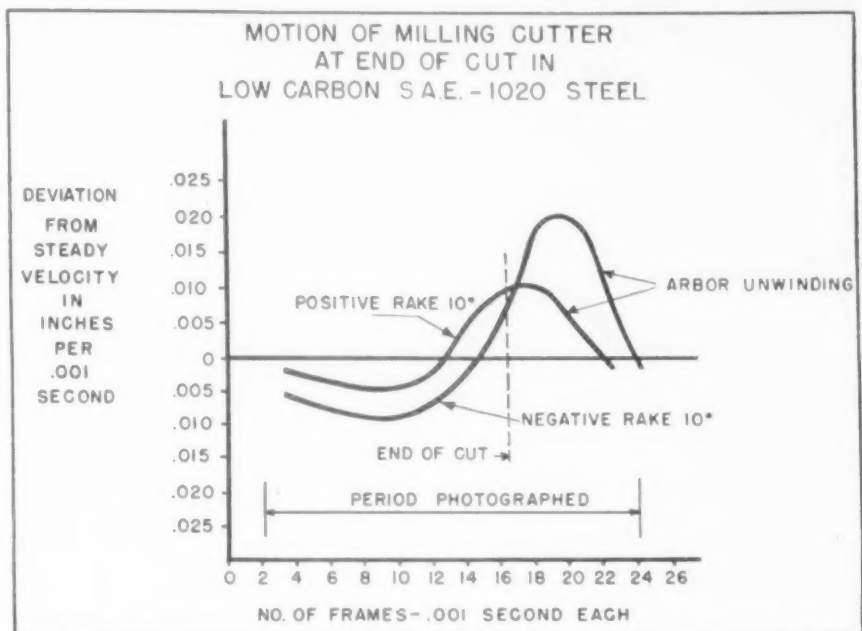
Cut by the planer, the chip of the iron block appeared to be very frag-



A quick movie glimpse of Planing tool and steel chip.



Milling steel at 36 feet per minute. Depth of cut is 3/16 inch, feed is 30 inches. Block marked by lines at 1/32-inch intervals.



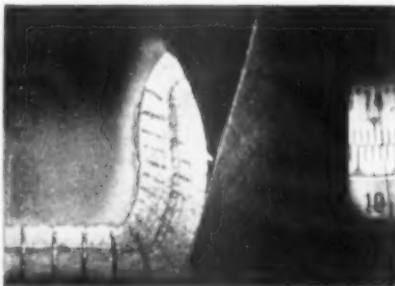
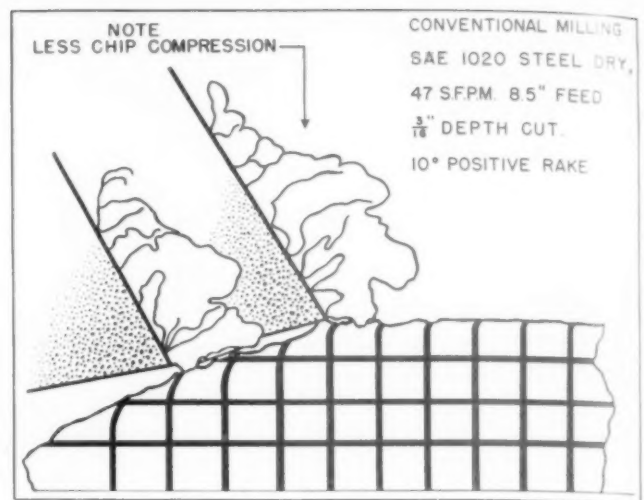
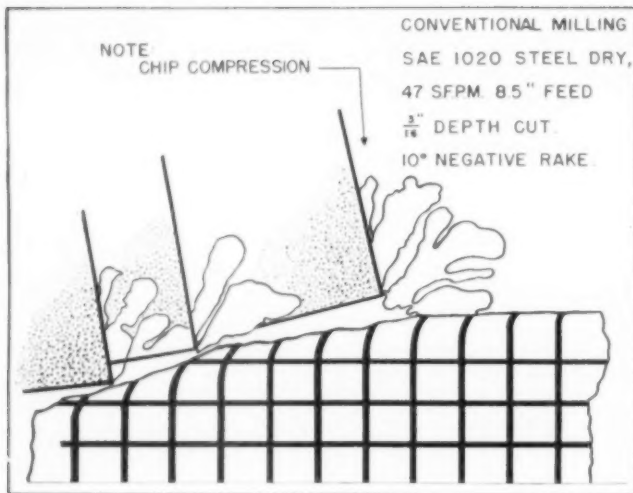
mentary, with a great distortion of the metal. Smaller pieces of metal are removed as a result of the abrasive action which occurs when large chips are broken off. The particles weld to the cutting edge of the tool and cause the built-up edge, resulting in tool failure and a rough finished surface.

Pieces of the block are broken off with varying degrees of intensity. When the work piece begins cutting, the pressure on the metal differs somewhat from the pressure exerted by the workpiece at the end of the block. At the beginning of the chip there is enough metal ahead to take compression and the cutter progresses regularly. As it nears the end, the compression is lessened with the length of the block and the end section breaks off a little below the average

surface removed. Thus the chip at the end differs slightly from the chip removed some distance from the end.

On the milling machine the cutters exert pressure on the arbor, in that when a tooth emerges from a cut, the energy in the shaft is released and the cutter jumps ahead. There is a pause while more pressure accumulates on the tooth to cause it to continue cutting. For the heavier cuts, this action is more pronounced.

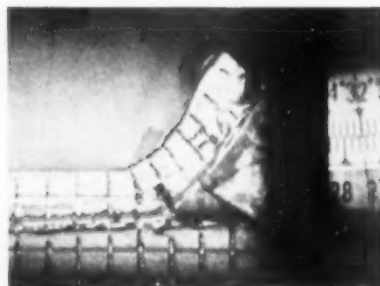
The use of high-speed photography has enabled those interested in the efficiency of metal cutting to learn what happens when metal meets the cutting edge of a machine tool, and to observe the action in detail. The films show the effect of various coolants on chip flow and what influence speed of cutting has on chip form.



PLANING: START OF CUT

Work tool, in shape of angle iron, cuts into machine steel at a speed of 36 feet per minute. Chip flow is plainly seen in "slowed down" movie frame. Depth is .040, width  $\frac{1}{4}$  inch. Rake angle is 16° and clearance 3°.

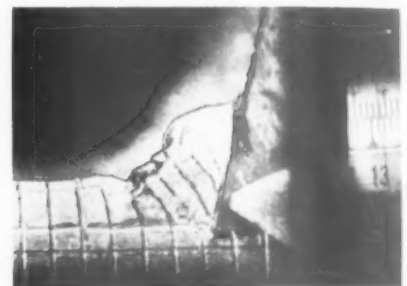
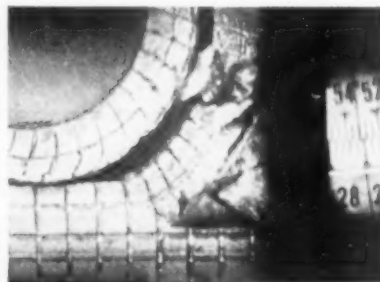
CENTER OF CUT



PLANING: START OF CUT

Another motion-picture study of machine steel, cross-hatched with  $\frac{1}{32}$ -inch squares, showing action at 36 feet per minute. Tool is 1 x  $\frac{1}{2}$  x 9 inches. Rake angle is 24°, clearance 3°. Depth is .040, width  $\frac{1}{4}$  inch.

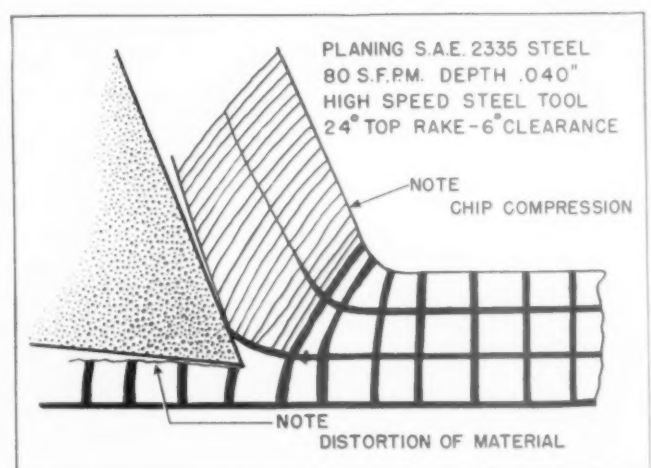
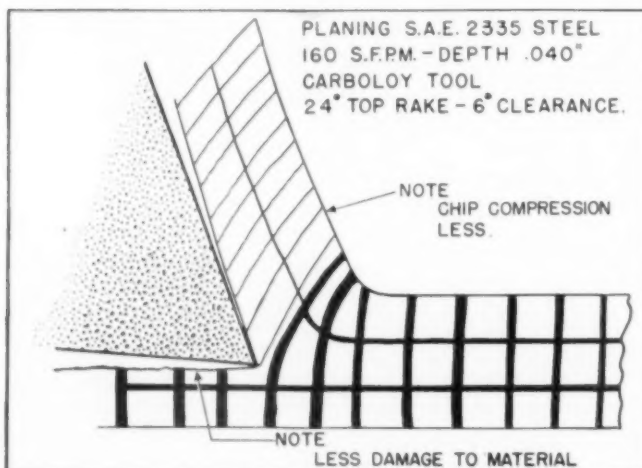
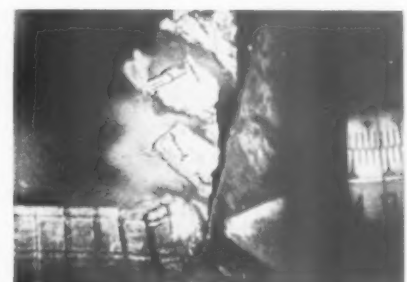
CENTER OF CUT

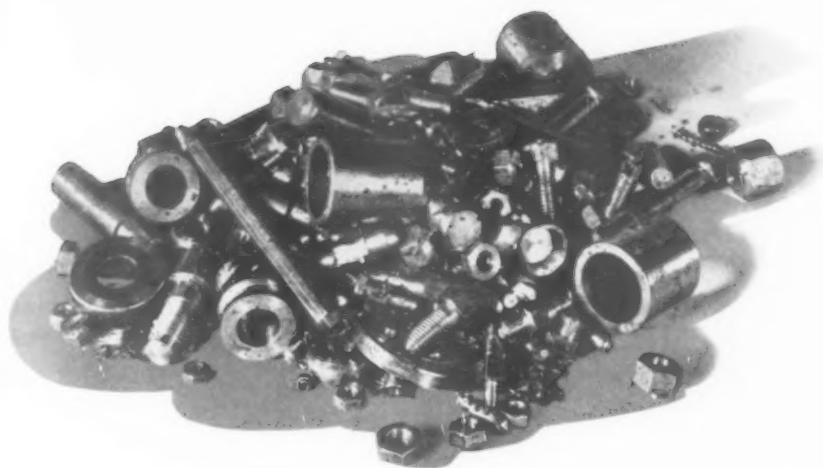


PLANING: START OF CUT

In this experiment brass is observed in detail as the high-speed cutting tool operates. In this instance the rake angle is 16° and the clearance 3°. Note the compression of the chips into wedge-shaped pieces.

CENTER OF CUT





As it is frequently within the duties of the Tool Engineer to properly apply cleaning equipment and materials, this article is designed to familiarize him with solvent degreasing . . . a process which has brought new cleaning efficiency to the fabrication of tools of war.

# Solvent Degreasing

## ITS RELATION TO TOOL ENGINEERING

W. W. DAVIDSON

VICE-PRESIDENT  
DETROIT REX PRODUCTS  
COMPANY

THE production cleaning process known as solvent degreasing is attracting the attention of Tool Engineers whose interest has been stimulated by many new war production applications. Through engineering research rapid developments have been made in solvent degreasing. Industrial applications, ranging in peacetime from hypodermic needles to large auto body parts and refrigerator boxes, have been increased by demands of war production.

Today, these principles are being applied to the cleaning of shells, fuses, bomb sights, cartridge clips, projectiles of all sizes, aircraft and automotive engines, body parts, guns and rifles, fire control apparatus, flight instruments — in fact all types and kinds of metal products, both ferrous and non-ferrous.

The process gives most rapid removal of oil and grease from these products prior to inspection, heat treating, finishing (including plating,



Above and below are shown a miscellaneous collection of screw machine parts, before and after cleaning by the solvent degreasing method. Depending upon the work to be cleaned and the degree of cleanliness required, this method may use singly or in combination any of three basic systems of solvent application.

lacquering, painting, and rust-proofing), and shipping. It is also finding use prior to machining operations where degreasing facilitates handling or machine efficiency and thus increases production speed.

Fundamentally, the process is simple, the three basic types of degreasers in general use being: (1) vapor, (2) immersion, and (3) spray. Depending upon the kind of work to be cleaned and the degree of cleanliness required, any combination of these three types may be incorporated into one unit.

Because they have a high vapor weight, low specific heat, and are

non-flammable, chlorinated solvents, also known as safety solvents, are used hot in metal degreasing. These solvents are stabilized against breakdown due to light, moisture, heat, various non-ferrous metals, fatty acids, etc. The organic base type of stabilizers\* used are soluble in the chlorinated solvent, volatilize with the solvent vapor during distillation, remain

\*The following U. S. Patent numbers cover the stabilization of chlorinated hydrocarbon solvents, and equipment for their use in industrial cleaning applications: 1,771,698; 1,869,826; 1,869,845; 1,875,937; 1,907,875; 1,911,926; 1,938,841; 1,942,355; 1,961,867; 1,984,364; 1,987,586; 2,016,376; 2,018,648; 2,020,335; 2,028,759; 2,036,261; 2,101,840; 2,101,841; 2,107,369; 2,113,129; 2,116,862; 2,116,863; 2,137,479; 2,214,788; 2,223,595; 2,273,939; RE-20,359.

soluble in the vapor and condense with it, thus rendering both the solvent and the condensate stable.

It is this development of the stabilization of the chlorinated solvents that made possible hot solvent degreasing with its advantages to industry. These advantages include: high speed removal of oil and grease; work comes from the degreaser warm, clean and dry, being ready for immediate finishing or inspection; less floor space is required; drying is eliminated; and operations are cleaner (steam vapors and the dripping of wet work are eliminated).

### Operation

The degreaser itself is essentially a thermo-balanced open still. The heating means at the bottom of the vessel may be steam, gas or electric. On application of heat the vapors rise to a predetermined height, this height being controlled by attaching a cooling condenser to the open tank some distance below the top. The vapors thus rise and condense within the machine, and by means of a trough or gutter the liquid solvent is collected and the stream can be directed as desired.

It is important for engineers and operators to realize that the solvent vapor in the degreaser is in contact with the open air. This air in motion contains moisture which may be transferred to the solvent vapors at the interfacial layer. This moisture, in addition to that accumulated from the metal being cleaned may become considerable and thus must be removed by a water separator, which is supplied with most degreasers.

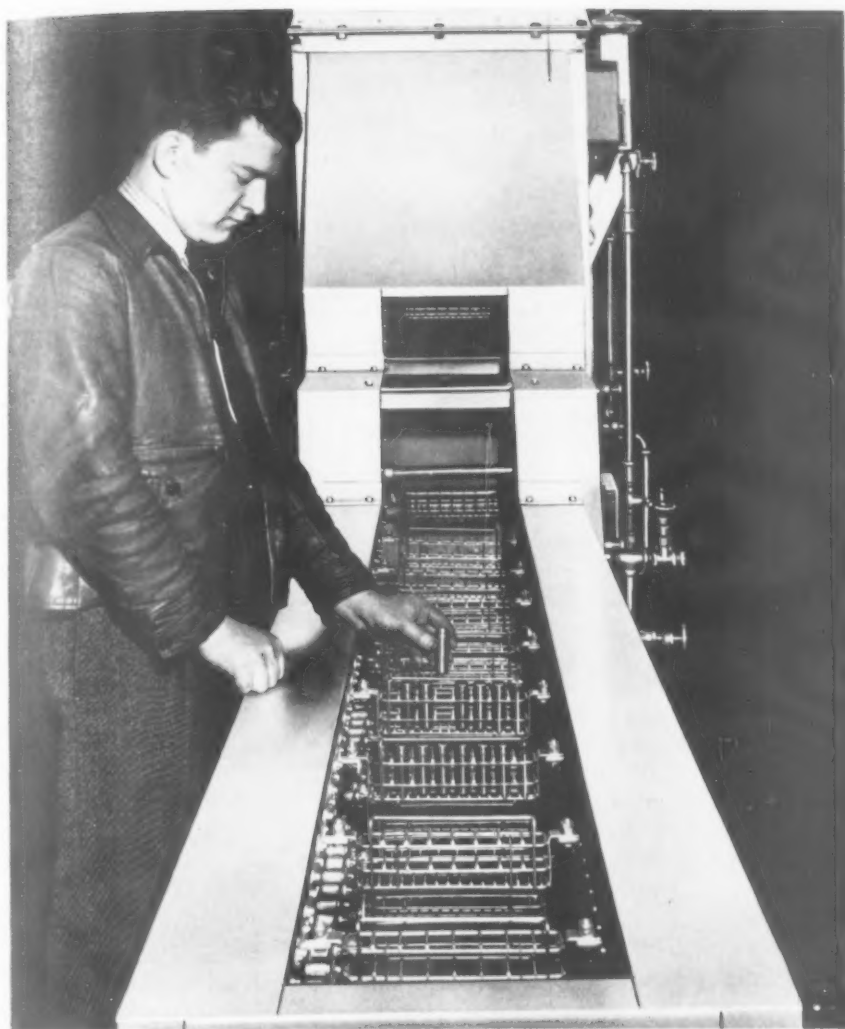
### Vapor Degreasing

In vapor degreasing the work to be cleaned is lowered into the vapor only. While in this position, the work being colder than the vapor, the chemically pure solvent vapor is condensed on it. To the Tool Engineer, this appears to be the Utopia of cleaning methods in that nothing but pure solvent touches the work. This is true, but this phase used alone has its limitations depending upon the degree and kind of contamination on the part and the gauge of metal being cleaned. However, the last phase in any degreasing operation is to remove the work through pure solvent vapors to

## Solvent Degreasing

### SOME TYPICAL APPLICATIONS

1. Removing mill rolling oil, rust proofing oil, and stamping lubricants from parts stamped from sheet stock. Solvent degreasing gets into and removes the oil from the pores of the metal.
2. Removing stamping or cutting oils prior to a bright dip. Solvent degreasing gives uniform oil removal and a uniform bright color.
3. Removing stamping, drawing and cutting oils prior to polishing and buffing. This eliminates loading of wheels and smudging of work. Cutting is faster, wiping easier and wheel life longer.
4. Removing stamping, drawing and cutting oils prior to plating. All kinds of oils are removed, thereby keeping subsequent solutions such as alkali cleaners, acid picklers, cyanide dips, and plating solutions free from oil contamination and oil scums on the top of solutions.
5. Removing stamping oils from pre-plated stock after stamping or forming. Pre-plated stock such as nickel used for vanity cases is stamped or formed, then the oils used in fabrication are removed, the surface remains lustrous without signs of streaks or water spots.
6. Extracting and removing winding oils from tightly woven wire cables prior to plating (for example from eye-glass temples).
7. Removing stamping, drawing, and cutting oils, and buffing compounds from aluminum. Solvent not only does a thorough oil removal job, but also eliminates alkali attack and water stains which would show through the colored surface.
8. Removing quenching oils prior to electrolytic descaling and plating. Solvent extracts oil from under loose heat scale and prepares work for electrolytic descaling so that tin or lead flashes to the base metal uniformly, thus protecting same from hydrogen embrittlement.
9. Removing lapping compounds prior to plating. This application is prevalent in hard-chrome plating of tools.
10. Removing buffing compounds prior to plating. Agitation of boiling solvent or the mechanical action of sprays removes grease, abrasive and lint from most surfaces, thereby eliminating hard scrubbing.
11. Removing buffing and coloring compounds after plating either in final finishing or in preparation for clean or colored lacquer. Work being thus prepared requires oil removal, natural luster, absence of dust film, and of vital importance is absolute freedom from any streaks or spots.
12. Removing tripoli compounds before color buffing. Work from solvent degreaser is free from grease and is dry. Color buffing operations are speeded.
13. Removing stop-off waxes from steel prior to carburizing. Waxes used for stop off are not water soluble. Solvent puts these waxes into solution and eliminates the fire hazard of former methods.
14. Removing deep drawing oils and greases prior to annealing.
15. Cleaning parts for inspection before and after magnaflux.



At left, operator loads 40-mm. shells in conveyor fixture for degreasing in the equipment shown in small lower picture.

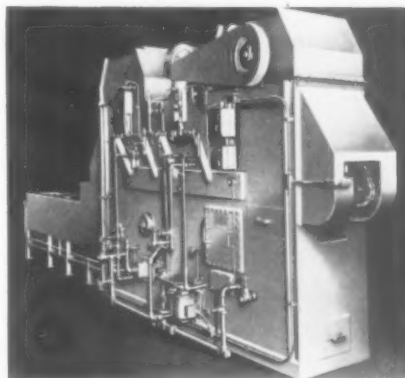
give the final cleaning action for the removal of the last trace of oil film.

### Advantages

Important advantages of vapor cleaning are: its extreme simplicity; less expensive apparatus; and only pure solvent vapors reach the work no matter how contaminated the boiling solvent becomes (because of the decided difference in boiling point between the dissolved oil or grease in the solvent). The complete cleaning cycle generally requires less than a minute.

Limitations of the vapor method alone are that: Light gauge metal parts may become heated by conduction preventing sufficient condensation before complete oil removal is obtained; cupped or intricate shaped parts and beaded work may contain air pockets which exclude the vapors; and practically no mechanical or washing action is obtained.

With immersion degreasing, on the



other hand, the work is lowered into boiling solvent to obtain a more positive degreasing action. The continuous sweep of the boiling solvent over the work gives a washing or scrubbing effect that assists in the removal of solid particles. Commonly designed machines have two and three chambers for immersion into the boiling solvent, rinse with clean solvent, and a final pure vapor cleaning phase.

To obtain even more mechanical cleaning action than that obtained by

the roll of boiling solvent in immersion type degreasers, pressure spray cleaning is employed. This method is also applicable where it is desired to use small quantities of solvent to clean work of large volume (it being less expensive to bring the solvent to the work than to immerse it in tanks of large solvent capacity). This the most positive method of removing caked-on or insoluble material. In this design of degreaser the work is first wet with solvent vapors, then warm solvent is pressure sprayed onto it to mechanically remove and drive off solid particles. The spraying operation is then followed by a final vapor rinse to insure complete removal of oil and grease.

### A Work Handling Problem

Of special interest to engineers tooling or expanding their plant for war production is the work of the cleaning engineer in analyzing each individual cleaning job. Factors entering into recommendations for equipment include not only the size and gauge of the work, amount of production, and material to be removed, but also the effect of previous operations on contamination introduced to the work, the requirements of subsequent finishing or production operations, type of handling means required, and the correlation of separate operations. By acquainting himself with the general principles involved, the Tool Engineer soon realizes the vital necessity for properly engineered cleaning methods.

After the basic consideration of the fundamental type of cleaning action required, the cleaning engineers work becomes closely allied to that of the Tool Engineer. In fact, it becomes a work handling problem, and the fitting of this process into the production sequence. While there are a few standard types of hand-operated degreasers available, by far the larger proportion of equipment is conveyorized, for either semi-automatic or fully automatic operation. Types of conveyor equipment include monorail, cross-rod conveyor, mesh belt, roller conveyors, and special type of work

handling means including rotating baskets, special fixtures, and automatic pick-up and discharge devices.

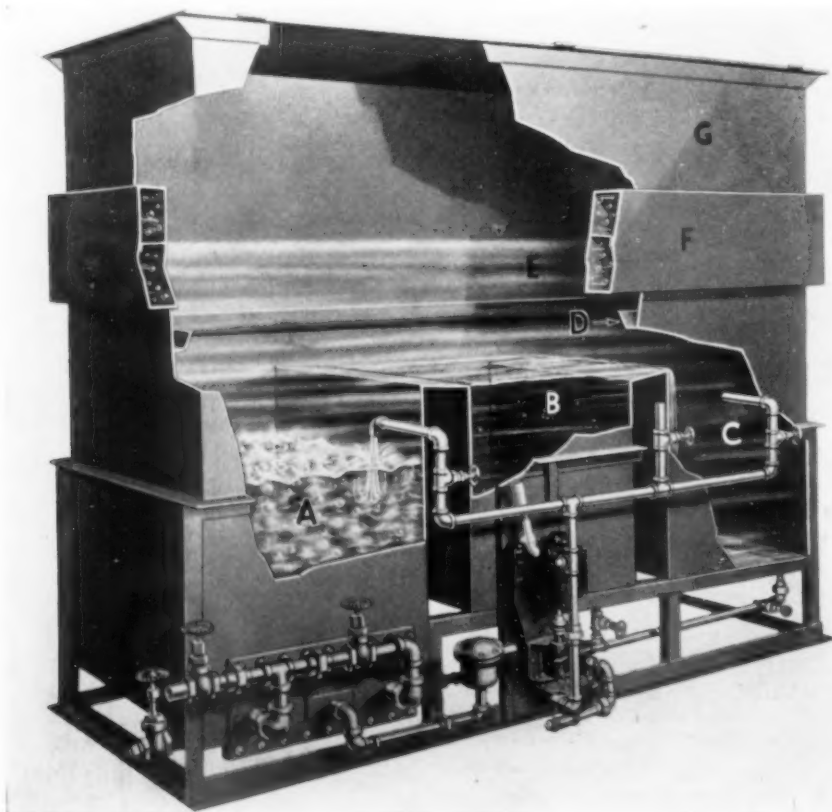
Though the speed of cleaning can be fitted to production needs, material should not be introduced at a rate that causes a pumping action, lifting vapor above the freeboard, and thus wasting it in the air. Normally, speed should not be more than 11 feet per minute vertically. Depending on the length of the equipment, conveyors can be installed at angles off the vertical which allows conveyor speeds of many times this, depending on the ratio of the angle to the vertical.

While most conveyorized degreasers are individually designed for the particular work to be cleaned, this type of equipment frequently lends itself to many other products by simple changes in fixtures, providing sufficient work space allowance has been incorporated into the original design. This is another reason why it is important for the Tool Engineer and the cleaning engineer to thoroughly plan together both the immediate and future applications for the equipment.

An equally important phase of the cleaning engineer's job concerns installation of the equipment. Important factors for the Tool Engineer to recognize in the cleaning engineer's effort to achieve maximum operating economy with correct operating procedure are: proper heat balance; draft elimination; proper servicing of pumps, valves, packing, gaskets and accessories; control of speed of work; avoidance of liquid carry-out; elimination of moisture; distillation for recovery of solvent . . . and proper training of operating personnel.

*Editor's note:* As solvent degreasing may be used on practically every metal product to remove oil, grease, fats, and even insoluble materials (such as abrasives, sulphonated compounds, emulsion compounds, and lime compounds, which adhere to the work but are not part of it) it is simpler to list applications by their position between operations rather than name the specific products on which it is used. Some typical applications are listed in this manner on page 68.

Below, cutaway view of three dip degreasing equipment. (A) boiling solvent chamber, (B) clean solvent rinse, (C) pure vapors, (D) trough to collect condensed vapors, (E) solvent vapors, (F) water jacket condenser, (G) sideboard. Conveyor dips parts to be cleaned into each of chambers A, B and C.



## GRIND THE TOOL WRONG FOR ROUGH SURFACE—

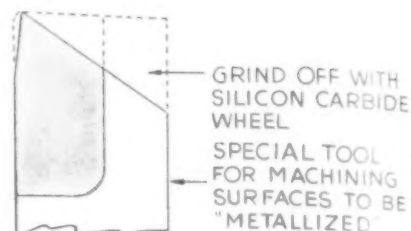


Figure 1.

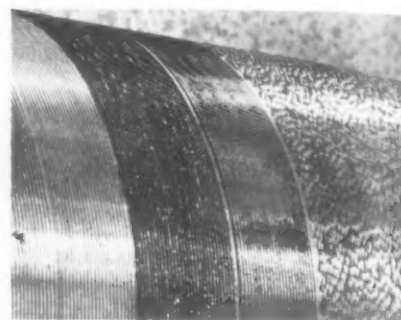


Figure 2.

MANY metals do not form a chemical bond when "metalized" or sprayed with metal. It is necessary to roughen their surface to form a mechanical bond.

All kinds of high-speed steel tools have been developed for this job, but hard-to-machine alloy steels proved a little too tough.

Engineers of the Carboloy Company recently discovered a solution. They figured that to produce a smooth surface, a correctly ground tool is used. For a rough one, grind it wrong.

On a standard tool they ground the nose to the unorthodox shape shown in Figure 1. What happened when they machined tough alloy steel with it is shown in Figure 2. The cuts are at different depths (0.010, 0.015, and 0.020 inches respectively) and the feed is approximately 0.030 inches.

The surface at extreme right is what the 0.020 depth and 0.030 inches feed produced. The "incorrectly ground" tool raised a burr between the tool marks, and the combination of angles was such that cutting pressure pushed the burr over into horizontal position. Figure 2 shows that the tool also lifts some of the crests intermittently, forming an ideal base for the adhesion of sprayed metal. Cutting speed was around 200 to 250 surface feet per minute.

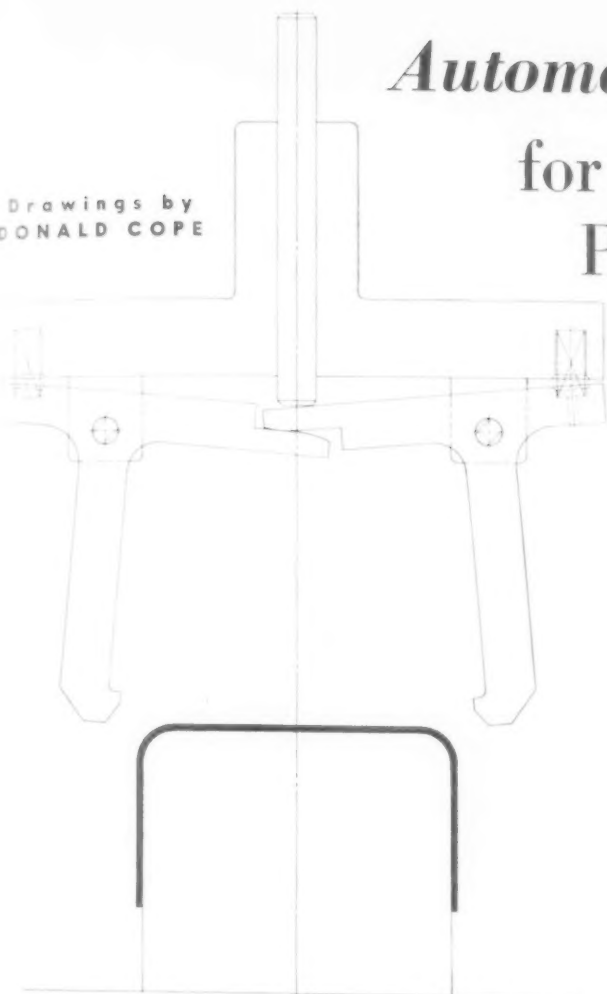
THE TOOL ENGINEER

Drawings by  
DONALD COPE

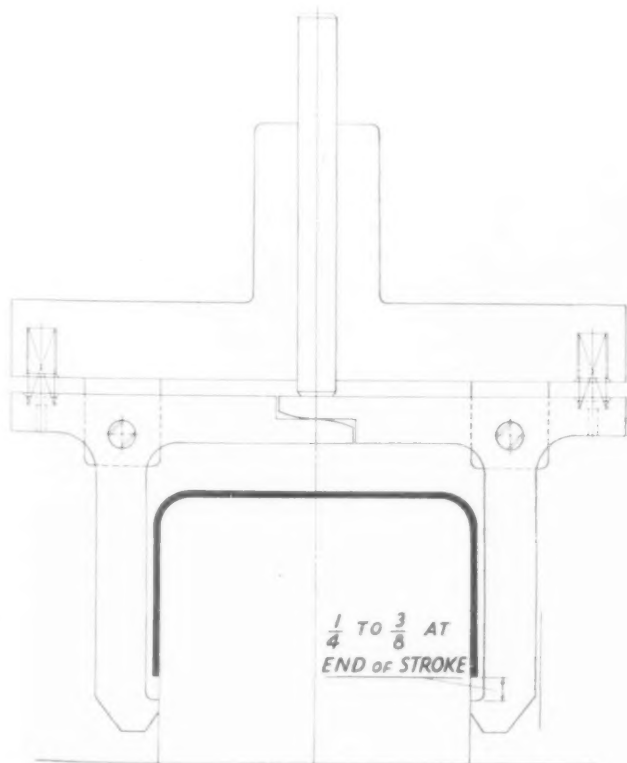
# Automatic Stripping Device for CAM-ACTUATED PIERCING DIES

STANLEY R. COPE

PRESIDENT,  
ACME SCHOOL OF DIE  
DESIGN ENGINEERING



In Figure One, above, the die is shown open with the lifting arms held outward by the action of the knockout pin pressing against them.



ONE of the most provoking things to a pressroom foreman is to find that another cam piercing die has been delivered to him with no provision to strip the pierced work from the die. In piercing drawn work by cam-actuated piercing punches, die designers invariably decide that the work can be easily removed by hand, so provide no mechanical stripper. The pressroom foreman, however, knows that it is not only a very unsafe practice to remove the parts by hand, but often a very difficult one.

After a few pieces have been pierced, burrs are formed around the holes. Their presence naturally makes the part difficult to remove, and more pull is ordinarily required than can be obtained by lifting with the hands.

Forcing the work from the die by prying with a bar or other object not only slows down the production, but encourages a dangerous practice. Often, operators try lifting with their hands, and then various forms of prying methods, and in their excitement even lean into the die, placing their head and shoulders directly under the punch while the flywheel of the press is still running. It is easy to picture the disaster that would befall the operator if the clutch of the press were accidentally engaged. He would not be wholly to blame. In that such practice is foolhardy and dangerous, it nevertheless is often done.

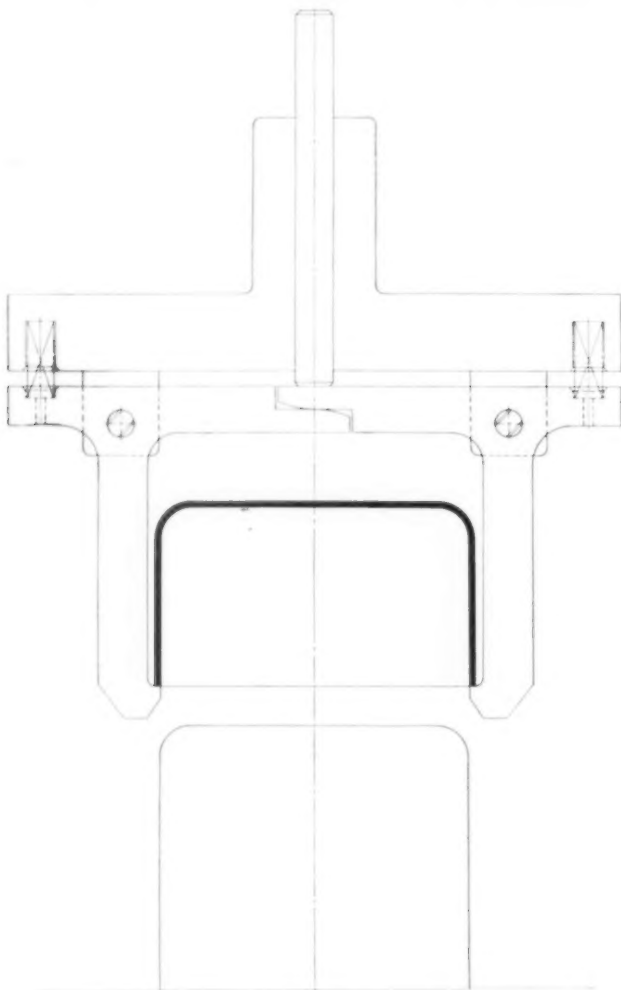
## Positive Action Important

The die designer can only protect himself against the responsibility of such accidents by providing the necessary stripping device that will do the job so well that the operator will have no cause to think of placing himself in a dangerous position. The stripping device shown, in varying arrangements, will serve stripping purposes for nearly all cam dies piercing drawn work. A device of this type is necessary on all dies excepting, perhaps, those piercing very shallow work.

In Figure 1, the die is shown in the open position with the lifting arms held outward by the action of the knockout pin pressing against them.

In Figure 2, the shell has been pierced. With the descent of the punch the arms have been released by the knockout pin, and sliding down the sides of the shell snap

In Figure Two, at left, the shell has been pierced. In the descent, the arms have been released by the knockout pin and sliding down the sides of the shell snap underneath it about  $\frac{1}{4}$  to  $\frac{3}{8}$  inches before end of stroke.



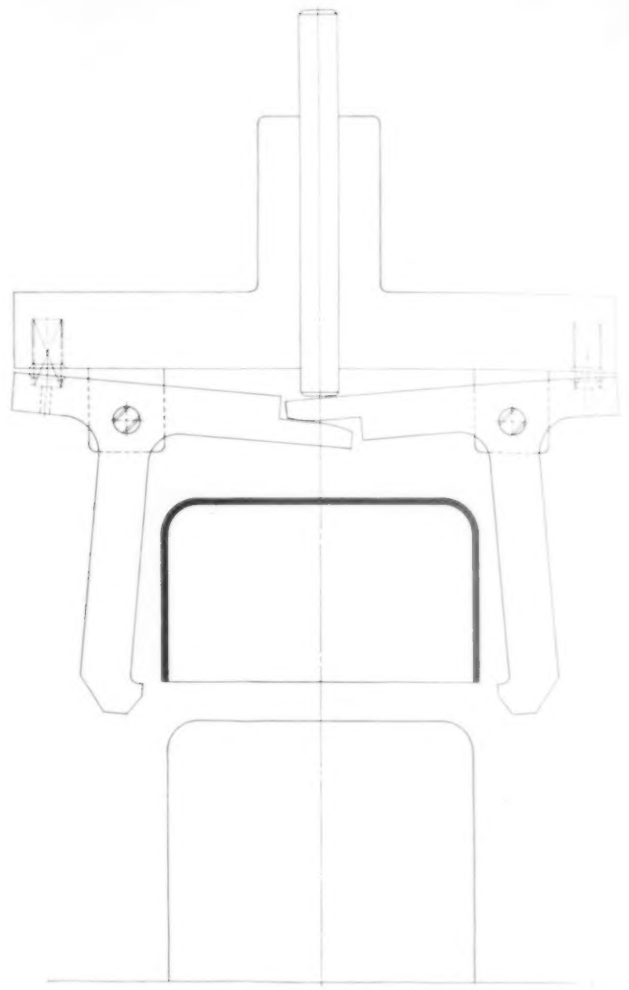
**In Figure Three, above, the shell is shown raised above the die but not yet released.**

underneath it about  $\frac{1}{4}$  to  $\frac{3}{8}$  inch before the end of the stroke. This distance is important because upon the return stroke the punches must have time to be stripped from the holes before the arms are allowed to contact the shell.

In Figure 3, the shell is shown raised above the die but not yet released. In the last illustration, Figure 4, the arms are shown again as they appear when the die is in the open position. Contacting the knockout pin they are automatically swung open, instantly releasing the pierced work. If the press is of the open back inclinable type, the shell will fall clear of the die without manual effort. If not, it will fall back on the die and can be easily and quickly removed.

Positive stripping arrangements to strip the work from both the punch and the die should be given serious consideration on all types of press operations. One common mistake among die designers is to assume that completed work will stick on either the punch or the die, and provide a stripper for that member only. They are either completely fooled, and the work sticks to the other member where a stripper has not been provided, or occasionally, perhaps one in a hundred, will stick.

If there is a tendency for them all to stick where a strip-



**In Figure Four, above, the arms are shown again as they appear when the die is in the open position. Contacting the knockout pin they automatically swing open instantly releasing the pierced work.**

per has not been provided, it will be obvious to the pressroom foreman that the die must be redesigned. This, of course, entails added expense, and nearly always at a time when the parts are badly needed. Needless to say the designer is criticised and his reputation is not helped. A more serious condition exists when only an occasional one sticks. Here immediate need for a stripper is not recognized and the operator is left to run the parts. When one sticks in the "wrong" place it is only human nature that he will try to pry it loose, often placing himself or the equipment in dangerous circumstances.

On one occasion, an operator who resorted to the use of a small crowbar, in his attempt to get the bar in position, accidentally stepped on the treadle and tripped the press. The die was broken, the crankshaft of the press was sprung, and the arms of the operator were badly wrenched. While the operator in this case was careless, the designer of the die was partially to blame for providing the pressroom with a faulty tool.

If there is any case of doubt at all, provide strippers in both the punch and die members. A second stripper can be built into a die at a fraction of the cost of adding one later. Even in the event it may be found unnecessary, the extra cost is always cheap insurance.

100,000 Ideas  
From Employees



WALLACE A. SCOTTEN

# Production Shortcuts

AROUND a table in a shop office of the Behemoth Ordnance Works a group of Tool Engineers are studying small sheets of paper, commenting, passing them back and forth. Those papers, thumb-marked and oil-stained, most of them written in pencil, are "America's Secret Weapon" — the ideas of men in the plant for the improvement of quality or increase of war production.

Duplicate this scene 1,000 times and you may have some conception of the scope of the nation-wide program underway to stimulate the man in the shop to tell management how he thinks his war production job can be done better. With few exceptions, mass production industry has long followed a time-worn policy that the engineer tells the man in the shop how stock will be handled, how a machine will be operated, how the job will be performed. The deluge of 100,000 and more ideas employees have showered on management since the commencement of this program suggest potent possibilities in continuing this co-operation between management and workers after the war.

The automotive industry, converted in 12 months from the mass-production of motor cars to the manufacture of airplanes, guns and tanks, has proven itself particularly receptive to employees suggestions. Ideas originating with the man on the machine are being funneled into committees of engineers in converted automobile shops for study.

More than 15,000 "produce more for victory" suggestions were made by workers in General Motors plants in

two months, B. D. Kunkle, vice president in charge of manufacturing, told us. Hundreds of ideas, he pointed out, already are being used and more than 10,000 have brought their originators awards in defense bonds and stamps in appreciation.

G. M. pointed to dozens of "suggestions" in use. At the Aeroproducts Division plant, which produces a new type of hollow steel, variable-pitch propeller, a worker had an idea that resulted in reclaiming hundreds of files formerly discarded. Work at this plant involves much handfiling in finishing processes. The worker boiled his suggestion down to three words, "Sand blast 'em." Experiments were

made in sandblasting discarded files. Now, they are used again and again.

At the corporation's Delco Products Division, an inspector suggested and built a machine that has eliminated a bottleneck in the manufacture of a vital part used in the fuel supply system of airplanes. When the product first went into production, it was realized that it would be necessary to test all aluminum end frame castings for propensity. This was done by sealing openings with a hand-operated clamp, applying pressure with an air hose, submerging in water and watching for air bubbles with a light. This was a laborious method. Proc-

(Continued on page 116)

Worker points to machine that he has suggested to replace hand operation



# AMERICAN SOCIETY OF TOOL ENGINEERS WAR PRODUCTION CONFERENCE



**WAR PRODUCTION CONFERENCE** is the name assigned to the 1942 Semi-Annual Meeting of A.S.T.E. at Springfield. Because the whole purpose of the meeting is an educational one, and because the whole effort of A.S.T.E. members is to produce more of better equipment in less time, the designation is particularly fitting.

More than 300 manufacturing plants in Springfield produce a diverse line of products with a value of more than 100 million dollars annually. These include machine tools, rifles, revolvers, pumps, magnetos, electric control and time equipment, motorcycles, Diesel motors and war materiel.

Home of the famous Springfield rifle and now of the Garand semi-automatic, the Springfield Armory can rightfully be called the birthplace of American skilled labor. Founded in 1794 by George Washington, the Armory has trained thousands of highly efficient workmen and made Springfield a center of Yankee mechanical genius.



*These sessions will afford comprehensive knowledge  
of latest developments in many fields - - -*

**E**MPHASIS will be placed on **INSPECTION** (why make it, if it won't fit?) **TOOL CONSERVATION** (making the most from what you have) **TRAINING** (new sources of production-hours) **WAR TOOLING** (learn how others are doing the "impossible") **MATERIALS SUBSTITUTION** (maybe the "next best" is better). • The Semi-Annual Banquet is scheduled for Saturday evening — with an excellent program planned to "top off" a most productive **WAR PRODUCTION CONFERENCE**.



## Program

FRIDAY — OCTOBER 16

### Morning—TRAINING

CHARLES C. GORHAM  
Supervisor of Training  
Greenfield Tap & Die Corporation  
Greenfield, Massachusetts

THOMAS O. ARMSTRONG  
Industrial Relations Manager  
Springfield Plant  
Westinghouse Electric & Manufacturing Company

ARNOLD THOMPSON  
Chief Tool Engineer  
National Steel Car Corporation, Ltd.  
Aircraft Division  
Malton, Ontario, Canada

### Afternoon—INSPECTION

HENRY RICHARDS, Chairman  
Chief Inspector Supercharger Plant  
General Electric Company  
Everett, Massachusetts

LT. COL. H. B. HAMBLETON  
Office of Chief of Ordnance  
Washington, D. C.

### Evening—TOOL CONSERVATION

ARTHUR A. MERRY  
Chief Tool Engineer  
Pratt & Whitney Aircraft  
East Hartford, Connecticut

L. W. LANG  
Manager  
National Tool Salvage Company  
Detroit, Michigan

DR. A. B. KINZEL  
Senior Consultant  
Conservation and Substitutions Branch  
W.P.B., Washington, D. C.

SATURDAY — OCTOBER 17

### Morning—WAR TOOLING

R. F. V. STANTON  
Manager, Sub-Contract Division  
Pratt & Whitney Division  
Niles Bement-Pond Company  
West Hartford, Connecticut

A. E. CLARK  
Director, Automotive Council for War Production  
Vice President, Budd Wheel Company  
Detroit, Michigan

ROBERT DALLAS  
United Shoe Machinery Corporation  
Beverly, Massachusetts

### Afternoon— MATERIALS SUBSTITUTIONS

J. B. SAVITS  
Methods Engineer  
Pneumatic Scale Corporation, Ltd.  
Boston, Massachusetts

P. S. CARSWELL  
Director of Research  
(Chemistry)

and

C. H. WHITLOCK  
Tech. Engineer  
(Applications)  
Monsanto Chemical Company  
Springfield, Massachusetts

### Evening—BANQUET

Speaker: THOMAS H. BECK  
President  
Crowell-Collier Publishing Company  
New York City

Guests will include: Ranking Officers of Army and Navy,  
Leading Industrialists, and others.

(PROGRAM SUBJECT TO ADDITIONS)

## COMMITTEE ON ARRANGEMENTS

General Chairman ..... FRANK W. CURTIS  
Vice-Chairmen ..... JOHN LINDEGREN  
IRWIN F. HOLLAND

### Sub-Committee Chairmen

CARL RISING ..... Program  
KENNETH ABBE ..... Banquet  
CHARLES STONEROD Physical Arrangements  
JAMES BRYAN ..... Publicity  
EDWARD C. SHELDON ..... Attendance  
EDWARD J. STONE ..... Exhibits

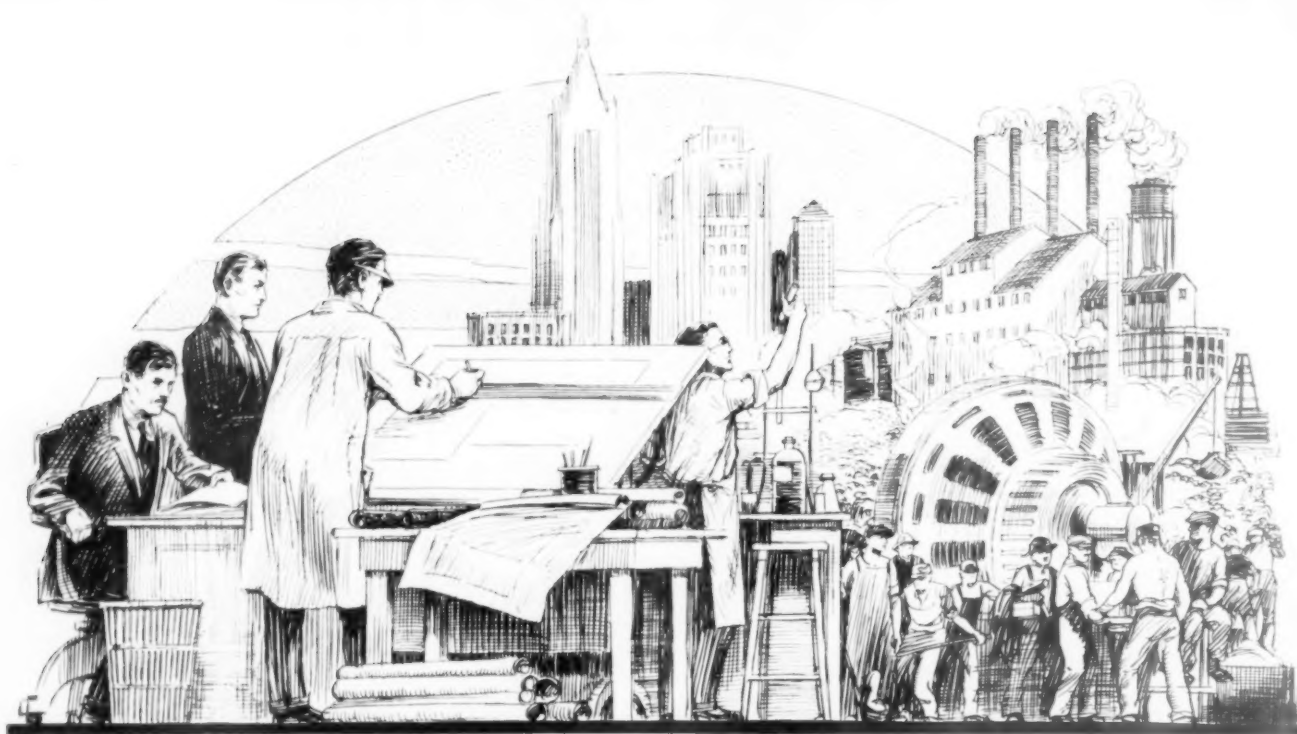


**SPRINGFIELD,  
MASSACHUSETTS  
OCTOBER 16 - 17**

SEPTEMBER, 1942



HOTEL KIMBALL  
CONFERENCE HEADQUARTERS



# Tool Engineering

## *ITS DEFINITION AND FUNCTION*

FLOYD EATON

TRAINING WITHIN INDUSTRY BRANCH  
WAR MAN POWER COMMISSION

**I**N defining Tool Engineering it might be best to go back to the early days of the Machine Age when the engineer designed a product and relied on the production mechanic to produce it from drawings. The mechanic made patterns, machined castings, made and assembled parts, computed costs—including provision for hard luck—and then handed the finished product to the sales department to sell the product at a price determined after its completion. Now it is considered more efficient to predetermine the cost of producing and selling an article before it is made.

The salesman's task has been made less difficult as the products are lower in price, the quality is better and facilities for servicing have been improved through the interchangeability of the component parts. As a result any factory which is able to produce its products in large quantities ahead of others in like fields enjoys immediate success in its sales efforts.

As the manufacture of machine-made products became common, competition developed. This brought about the necessity for new manufacturing practice based on the science of economic production. Industry began to recognize that production planning and cost determination had become as necessary as the engineering which conceived the product or the methods for its distribution.

These new responsibilities required direction, and from the ranks of production came a group which now shoulders this new burden. It consisted of men who understood machines, and were able to visualize the evolution of a finished article, as a series of manufacturing operations. These men further qualified themselves by being able to estimate the cost of jobs within fractions of cents by various methods, as well as being able to conceive, design and select new machines, equipment or tools to better facilitate an economical and qual-

ity production. This latter statement is especially true when the equipment on hand could not suitably handle the production involved.

The Tool Engineer is the organizer of the batteries of machines, tools and equipment that characterizes modern industry. He, being familiar with their peculiarities and capabilities, knows how to fit each one in its proper place so that the whole layout operates smoothly in the manufacturing division. He selects the right processes and the right equipment making sure that each machine is properly equipped with the right kind of tools and fixtures so that the particular production assignment is carried out effectively. He is industry's new manufacturing strategist who is rapidly becoming the final judge as to whether or not a new idea is economically feasible. Upon his decision rests the responsibility of showing

(Continued on page 118)

THE TOOL ENGINEER

# CLEARANCES FOR FINE PITCH GEARS OF INVOLUTE FORM

1. This recommended practice establishes the clearances, suitable for gears of fine pitch of *involute form*.
2. The Fine Pitch Series has been set as 30 D.P. and finer.
3. The recommended Clearances replace those now in use in Fine Pitch Gears.

It is generally known that fine pitch gears must have a greater percentage of clearance relative to their depths than those of coarser pitch. There are several reasons for this:

*First*, provision must be made for dirt at the bottom of the gear teeth.

*Second*, the point of a generating tool will become dull very soon after put

in use, to a degree where the edge radius produced on the point of the generating tool is, in many cases, greater than the clearance permitted by the generally accepted formula of .157

D.P.

The recommended practice employs a formula which covers the entire Fine Pitch Range, and which utilizes a variable whole depths factor, thus providing a greater percentage of clearance as the pitch becomes finer.

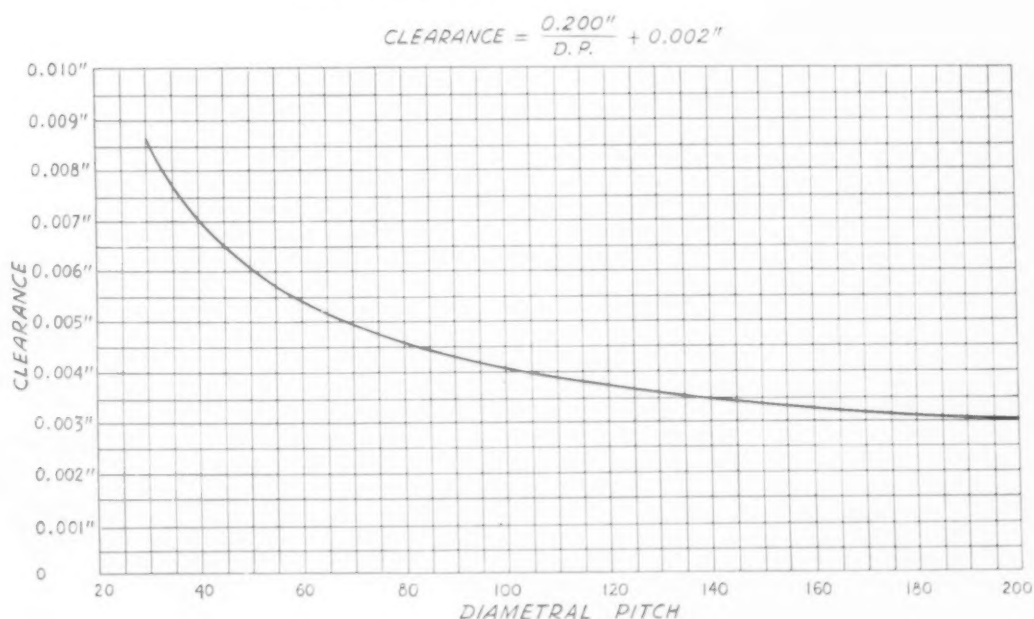
The proportions are expressed as follows:

Working depth	$\frac{2.000''}{D.P.}$
Whole depth	$\frac{2.200''}{D.P.} + .002''$
Clearance	$\frac{.200''}{D.P.} + .002''$
Whole depth factor	$2.200'' + (.002'' \times D.P.)$

In the following three pages appears the Table of Standard Tooth Parts, employing A.G.M.A. Recommended Clearances for fine pitch gears. The maximum recommended tolerance for cutter addendum is plus 20%, minus 0.



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COURTESY OF  
AMERICAN  
GEAR  
MANUFACTURERS  
ASSOCIATION  
(c) 1942



# CLEARANCES FOR FINE PITCH GEARS

DP	CIRCULAR PITCH	STANDARD CIRCULAR THICK	WORKING DEPTH	WHOLE DEPTH	CLEARANCE	STANDARD ADDENDUM	STANDARD DEDENDUM
30	0.10472	0.05236	0.0667	0.0753	0.0087	0.0333	0.0420
31	0.10134	0.05067	0.0645	0.0730	0.0085	0.0323	0.0407
32	0.09818	0.04909	0.0625	0.0708	0.0083	0.0313	0.0395
33	0.09520	0.04760	0.0606	0.0687	0.0081	0.0303	0.0384
34	0.09240	0.04620	0.0588	0.0667	0.0079	0.0294	0.0373
35	0.08976	0.04488	0.0571	0.0649	0.0077	0.0286	0.0363
36	0.08727	0.04363	0.0556	0.0631	0.0076	0.0278	0.0353
37	0.08491	0.04245	0.0541	0.0615	0.0074	0.0270	0.0344
38	0.08267	0.04134	0.0526	0.0599	0.0073	0.0263	0.0336
39	0.08055	0.04028	0.0513	0.0584	0.0071	0.0256	0.0328
40	0.07854	0.03927	0.0500	0.0570	0.0070	0.0250	0.0320
41	0.07662	0.03831	0.0488	0.0557	0.0069	0.0244	0.0313
42	0.07480	0.03740	0.0476	0.0544	0.0068	0.0238	0.0306
43	0.07306	0.03653	0.0465	0.0532	0.0067	0.0233	0.0299
44	0.07140	0.03570	0.0455	0.0520	0.0065	0.0227	0.0293
45	0.06981	0.03491	0.0444	0.0509	0.0064	0.0222	0.0287
46	0.06830	0.03415	0.0435	0.0498	0.0063	0.0217	0.0281
47	0.06684	0.03342	0.0426	0.0488	0.0063	0.0213	0.0275
48	0.06545	0.03272	0.0417	0.0478	0.0062	0.0208	0.0270
49	0.06411	0.03206	0.0408	0.0469	0.0061	0.0204	0.0265
50	0.06283	0.03142	0.0400	0.0460	0.0060	0.0200	0.0260
51	0.06160	0.03080	0.0392	0.0451	0.0059	0.0196	0.0255
52	0.06042	0.03021	0.0385	0.0443	0.0058	0.0192	0.0251
53	0.05928	0.02964	0.0377	0.0435	0.0058	0.0189	0.0246
54	0.05818	0.02909	0.0370	0.0427	0.0057	0.0185	0.0242
55	0.05712	0.02856	0.0364	0.0420	0.0056	0.0182	0.0238
56	0.05610	0.02805	0.0357	0.0406	0.0055	0.0175	0.0231
57	0.05512	0.02756	0.0351	0.0413	0.0056	0.0179	0.0234
58	0.05417	0.02708	0.0345	0.0399	0.0054	0.0172	0.0227
59	0.05325	0.02662	0.0339	0.0393	0.0054	0.0169	0.0223
60	0.05236	0.02618	0.0333	0.0387	0.0053	0.0167	0.0220
61	0.05150	0.02575	0.0328	0.0381	0.0053	0.0164	0.0217
62	0.05067	0.02534	0.0323	0.0375	0.0052	0.0161	0.0214
63	0.04987	0.02493	0.0317	0.0369	0.0052	0.0159	0.0210
64	0.04909	0.02454	0.0312	0.0364	0.0051	0.0156	0.0208
65	0.04833	0.02417	0.0308	0.0358	0.0051	0.0154	0.0205
66	0.04760	0.02380	0.0303	0.0353	0.0050	0.0152	0.0202
67	0.04689	0.02344	0.0299	0.0348	0.0050	0.0149	0.0199
68	0.04620	0.02310	0.0294	0.0344	0.0049	0.0147	0.0196
69	0.04553	0.02277	0.0290	0.0339	0.0049	0.0145	0.0194
70	0.04488	0.02244	0.0286	0.0334	0.0049	0.0143	0.0191
71	0.04425	0.02212	0.0282	0.0330	0.0048	0.0141	0.0189
72	0.04363	0.02182	0.0278	0.0326	0.0048	0.0139	0.0187
73	0.04304	0.02152	0.0274	0.0321	0.0047	0.0137	0.0184
74	0.04245	0.02123	0.0270	0.0317	0.0047	0.0135	0.0182
75	0.04189	0.02094	0.0267	0.0313	0.0047	0.0133	0.0180
76	0.04134	0.02067	0.0263	0.0309	0.0046	0.0132	0.0178
77	0.04080	0.02040	0.0260	0.0306	0.0046	0.0130	0.0176
78	0.04028	0.02014	0.0256	0.0302	0.0046	0.0128	0.0174
79	0.03977	0.01988	0.0253	0.0298	0.0045	0.0127	0.0172
80	0.03927	0.01964	0.0250	0.0295	0.0045	0.0125	0.0170
81	0.03879	0.01939	0.0247	0.0292	0.0045	0.0123	0.0168
82	0.03831	0.01916	0.0244	0.0288	0.0044	0.0122	0.0166
83	0.03785	0.01893	0.0241	0.0285	0.0044	0.0120	0.0165
84	0.03740	0.01870	0.0238	0.0282	0.0044	0.0119	0.0163
85	0.03696	0.01848	0.0235	0.0279	0.0044	0.0118	0.0161
86	0.03653	0.01827	0.0233	0.0276	0.0043	0.0116	0.0160
87	0.03611	0.01806	0.0230	0.0273	0.0043	0.0115	0.0158

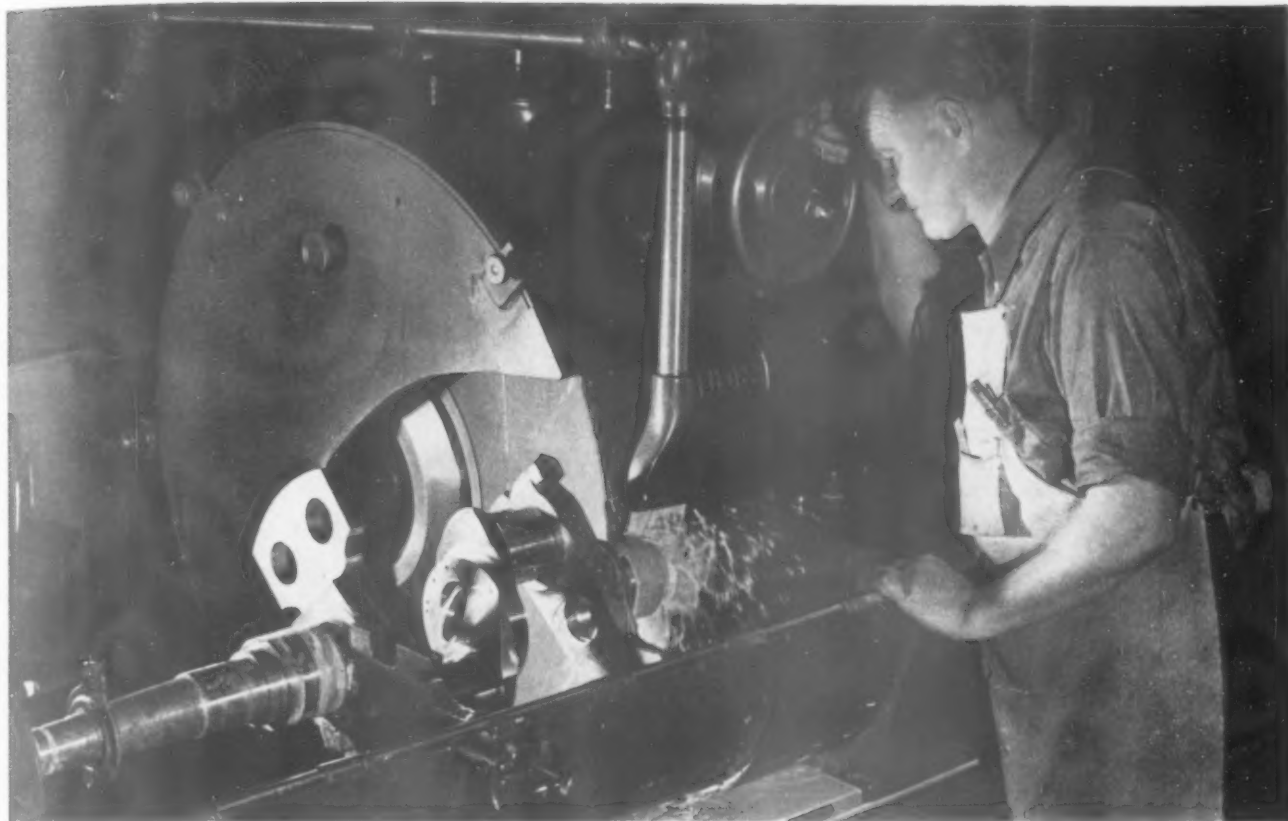
# **CLEARANCES FOR FINE PITCH GEARS**

DP	CIRCULAR PITCH	STANDARD CIRCULAR THICK	WORKING DEPTH	WHOLE DEPTH	CLEARANCE	STANDARD ADDENDUM	STANDARD DEDENDUM
88	0.03570	0.01785	0.0227	0.0270	0.0043	0.0114	0.0156
89	0.03530	0.01765	0.0225	0.0267	0.0042	0.0112	0.0155
90	0.03491	0.01745	0.0222	0.0264	0.0042	0.0111	0.0153
91	0.03452	0.01726	0.0220	0.0262	0.0042	0.0110	0.0152
92	0.03415	0.01707	0.0217	0.0259	0.0042	0.0109	0.0150
93	0.03378	0.01689	0.0215	0.0257	0.0042	0.0108	0.0149
94	0.03342	0.01671	0.0213	0.0254	0.0041	0.0106	0.0148
95	0.03307	0.01653	0.0211	0.0252	0.0041	0.0105	0.0146
96	0.03272	0.01636	0.0208	0.0249	0.0041	0.0104	0.0145
97	0.03239	0.01619	0.0206	0.0247	0.0041	0.0103	0.0144
98	0.03206	0.01603	0.0204	0.0244	0.0040	0.0102	0.0142
99	0.03173	0.01587	0.0202	0.0242	0.0040	0.0101	0.0141
100	0.03142	0.01571	0.0200	0.0240	0.0040	0.0100	0.0140
101	0.03110	0.01555	0.0198	0.0238	0.0040	0.0099	0.0139
102	0.03080	0.01540	0.0196	0.0236	0.0040	0.0098	0.0138
103	0.03050	0.01525	0.0194	0.0234	0.0039	0.0097	0.0137
104	0.03021	0.01510	0.0192	0.0232	0.0039	0.0096	0.0135
105	0.02992	0.01496	0.0190	0.0230	0.0039	0.0095	0.0134
106	0.02964	0.01482	0.0189	0.0228	0.0039	0.0094	0.0133
107	0.02936	0.01468	0.0187	0.0226	0.0039	0.0093	0.0132
108	0.02909	0.01454	0.0185	0.0224	0.0039	0.0093	0.0131
109	0.02882	0.01441	0.0183	0.0222	0.0038	0.0092	0.0130
110	0.02856	0.01428	0.0182	0.0220	0.0038	0.0091	0.0129
111	0.02830	0.01415	0.0180	0.0218	0.0038	0.0090	0.0128
112	0.02805	0.01402	0.0179	0.0216	0.0038	0.0089	0.0127
113	0.02780	0.01390	0.0177	0.0215	0.0038	0.0088	0.0126
114	0.02756	0.01378	0.0175	0.0213	0.0038	0.0088	0.0125
115	0.02732	0.01366	0.0174	0.0211	0.0037	0.0087	0.0124
116	0.02708	0.01354	0.0172	0.0210	0.0037	0.0086	0.0123
117	0.02685	0.01343	0.0171	0.0208	0.0037	0.0085	0.0123
118	0.02662	0.01331	0.0169	0.0206	0.0037	0.0085	0.0122
119	0.02640	0.01320	0.0168	0.0205	0.0037	0.0084	0.0121
120	0.02618	0.01309	0.0167	0.0203	0.0037	0.0083	0.0120
121	0.02596	0.01298	0.0165	0.0202	0.0037	0.0083	0.0119
122	0.02575	0.01288	0.0164	0.0200	0.0036	0.0082	0.0118
123	0.02554	0.01277	0.0163	0.0199	0.0036	0.0081	0.0118
124	0.02534	0.01267	0.0161	0.0197	0.0036	0.0081	0.0117
125	0.02513	0.01257	0.0160	0.0196	0.0036	0.0080	0.0116
126	0.02493	0.01247	0.0159	0.0195	0.0036	0.0079	0.0115
127	0.02474	0.01237	0.0157	0.0193	0.0036	0.0079	0.0114
128	0.02454	0.01227	0.0156	0.0192	0.0036	0.0078	0.0114
129	0.02435	0.01218	0.0155	0.0191	0.0036	0.0078	0.0113
130	0.02417	0.01208	0.0154	0.0189	0.0035	0.0077	0.0112
131	0.02398	0.01199	0.0153	0.0188	0.0035	0.0076	0.0112
132	0.02380	0.01190	0.0152	0.0187	0.0035	0.0076	0.0111
133	0.02362	0.01181	0.0150	0.0185	0.0035	0.0075	0.0110
134	0.02344	0.01172	0.0149	0.0184	0.0035	0.0075	0.0110
135	0.02327	0.01164	0.0148	0.0183	0.0035	0.0074	0.0109
136	0.02310	0.01155	0.0147	0.0182	0.0035	0.0074	0.0108
137	0.02293	0.01147	0.0146	0.0181	0.0035	0.0073	0.0108
138	0.02277	0.01138	0.0145	0.0179	0.0034	0.0072	0.0107
139	0.02260	0.01130	0.0144	0.0178	0.0034	0.0072	0.0106
140	0.02244	0.01122	0.0143	0.0177	0.0034	0.0071	0.0106
141	0.02228	0.01114	0.0142	0.0176	0.0034	0.0071	0.0105
142	0.02212	0.01106	0.0141	0.0175	0.0034	0.0070	0.0105
143	0.02197	0.01098	0.0140	0.0174	0.0034	0.0070	0.0104
144	0.02182	0.01091	0.0139	0.0173	0.0034	0.0069	0.0103

# **CLEARANCES FOR FINE PITCH GEARS**

DP	CIRCULAR PITCH	STANDARD CIRCULAR THICK	WORKING DEPTH	WHOLE DEPTH	CLEARANCE	STANDARD ADDENDUM	STANDARD DEDENDUM
145	0.02167	0.01083	0.0138	0.0172	0.0034	0.0069	0.0103
146	0.02152	0.01076	0.0137	0.0171	0.0034	0.0068	0.0102
147	0.02137	0.01069	0.0136	0.0170	0.0034	0.0068	0.0102
148	0.02123	0.01061	0.0135	0.0169	0.0034	0.0068	0.0101
149	0.02108	0.01054	0.0134	0.0168	0.0033	0.0067	0.0101
150	0.02094	0.01047	0.0133	0.0167	0.0033	0.0067	0.0100
151	0.02081	0.01040	0.0132	0.0166	0.0033	0.0066	0.0099
152	0.02067	0.01033	0.0132	0.0165	0.0033	0.0066	0.0099
153	0.02053	0.01027	0.0131	0.0164	0.0033	0.0065	0.0098
154	0.02040	0.01020	0.0130	0.0163	0.0033	0.0065	0.0098
155	0.02027	0.01013	0.0129	0.0162	0.0033	0.0065	0.0097
156	0.02014	0.01007	0.0128	0.0161	0.0033	0.0064	0.0097
157	0.02001	0.01001	0.0127	0.0160	0.0033	0.0064	0.0096
158	0.01988	0.00994	0.0127	0.0159	0.0033	0.0063	0.0096
159	0.01976	0.00988	0.0126	0.0158	0.0033	0.0063	0.0095
160	0.01964	0.00982	0.0125	0.0158	0.0032	0.0063	0.0095
161	0.01951	0.00976	0.0124	0.0157	0.0032	0.0062	0.0095
162	0.01939	0.00970	0.0123	0.0156	0.0032	0.0062	0.0094
163	0.01927	0.00964	0.0123	0.0155	0.0032	0.0061	0.0094
164	0.01916	0.00958	0.0122	0.0154	0.0032	0.0061	0.0093
165	0.01904	0.00952	0.0121	0.0153	0.0032	0.0061	0.0093
166	0.01893	0.00946	0.0120	0.0153	0.0032	0.0060	0.0092
167	0.01881	0.00941	0.0120	0.0152	0.0032	0.0060	0.0092
168	0.01870	0.00935	0.0119	0.0151	0.0032	0.0060	0.0091
169	0.01859	0.00929	0.0118	0.0150	0.0032	0.0059	0.0091
170	0.01848	0.00924	0.0118	0.0149	0.0032	0.0059	0.0091
171	0.01837	0.00919	0.0117	0.0149	0.0032	0.0058	0.0090
172	0.01827	0.00913	0.0116	0.0148	0.0032	0.0058	0.0090
173	0.01816	0.00908	0.0116	0.0147	0.0032	0.0058	0.0089
174	0.01806	0.00903	0.0115	0.0146	0.0031	0.0057	0.0089
175	0.01795	0.00898	0.0114	0.0146	0.0031	0.0057	0.0089
176	0.01785	0.00893	0.0114	0.0145	0.0031	0.0057	0.0088
177	0.01775	0.00887	0.0113	0.0144	0.0031	0.0056	0.0088
178	0.01765	0.00882	0.0112	0.0144	0.0031	0.0056	0.0087
179	0.01755	0.00878	0.0112	0.0143	0.0031	0.0056	0.0087
180	0.01745	0.00873	0.0111	0.0142	0.0031	0.0056	0.0087
181	0.01736	0.00868	0.0110	0.0142	0.0031	0.0055	0.0086
182	0.01726	0.00863	0.0110	0.0141	0.0031	0.0055	0.0086
183	0.01717	0.00858	0.0109	0.0140	0.0031	0.0055	0.0086
184	0.01707	0.00854	0.0109	0.0140	0.0031	0.0054	0.0085
185	0.01698	0.00849	0.0108	0.0139	0.0031	0.0054	0.0085
186	0.01689	0.00845	0.0108	0.0138	0.0031	0.0054	0.0085
187	0.01680	0.00840	0.0107	0.0138	0.0031	0.0053	0.0084
188	0.01671	0.00836	0.0106	0.0137	0.0031	0.0053	0.0084
189	0.01662	0.00831	0.0106	0.0136	0.0031	0.0053	0.0083
190	0.01653	0.00827	0.0105	0.0136	0.0031	0.0053	0.0083
191	0.01645	0.00822	0.0105	0.0135	0.0030	0.0052	0.0083
192	0.01636	0.00818	0.0104	0.0135	0.0030	0.0052	0.0082
193	0.01628	0.00814	0.0104	0.0134	0.0030	0.0052	0.0082
194	0.01619	0.00810	0.0103	0.0133	0.0030	0.0052	0.0082
195	0.01611	0.00806	0.0103	0.0133	0.0030	0.0051	0.0082
196	0.01603	0.00801	0.0102	0.0132	0.0030	0.0051	0.0081
197	0.01595	0.00797	0.0102	0.0132	0.0030	0.0051	0.0081
198	0.01587	0.00793	0.0101	0.0131	0.0030	0.0051	0.0081
199	0.01579	0.00789	0.0101	0.0131	0.0030	0.0050	0.0080
200	0.01571	0.00785	0.0100	0.0130	0.0030	0.0050	0.0080

## ON THE PRODUCTION FRONT



Landis crankshaft grinder finishing aircraft crankshaft.

# GRINDING



SEPTEMBER, 1942

*Mass producing new finishes and profiling new shapes, grinding is a powerful weapon on the production front. Broader application of its fundamentals is leading to new combinations of wheels, machines and men.*

*Though much being done now comes under the heading of production secrets, **THE TOOL ENGINEER** is able to present here some of today's interesting applications. More important, however, should be the basic data which following pages contain. From such data, grinding progress has been made.*

*From such data, too, the Tool Engineer can find material essential to his job of educating inexperienced labor. These pages should contribute to the conversion of man power to essential work on the production front.*

## ON THE PRODUCTION FRONT

Surface smoothness is important to operating characteristics. Here are explained methods of determining metal finishes.

# Measuring Metal Surfaces

L. H. MILLIGAN

ASSISTANT DIRECTOR OF RESEARCH  
NORTON COMPANY

IN general, metal finishing by mechanical methods employs abrasive operations, since abrasives are the best method by which the desired qualities of dimensional accuracy and surface smoothness may be obtained.

First let us consider what these surfaces are, how they look, and what kind of abrasive tools are used to produce them.

Grinding wheels, honing sticks, and other abrasive tools function because the individual abrasive grains which constitute the cutting points of these tools are permitted to cut chips from the work until they become dulled through use. Then for most uses they should break out from the surface of the abrasive product so as to permit other new grains with sharp edges to function.

Clearance for the metal chips must be provided at the working surface of the abrasive product. A solid wheel composed only of a solid piece of abrasive with no pores would have no cutting action whatever. The essential characteristic of an abrasive product is that it have at its cutting surface the three constituents—abrasive grains, bond, and pore spaces.

### Abrasive Descriptions

The abrasives in common commercial use consist of either Crystalline alumina (aluminum oxide) or crystalline silicon carbide. Most manufacturers have trade names for these materials. Each has its field of use, and there are different types of each material available, differing in purity, color or other characteristics.

In addition, for grinding extremely hard materials such as machine tools

made of Carboloy, Firthite, or other cemented carbide products, grinding wheels are used in which the abrasive is real diamonds. Also, when considering abrasives in general, such abrasive materials should be mentioned as sand and sandstone, which constitute the old grindstone that many farm boys still turn while their fathers sharpen the scythe. Perhaps also steel shot and grit should be included, but the kind of abrasive surfacing operations of chief interest do not use these materials to any extent.

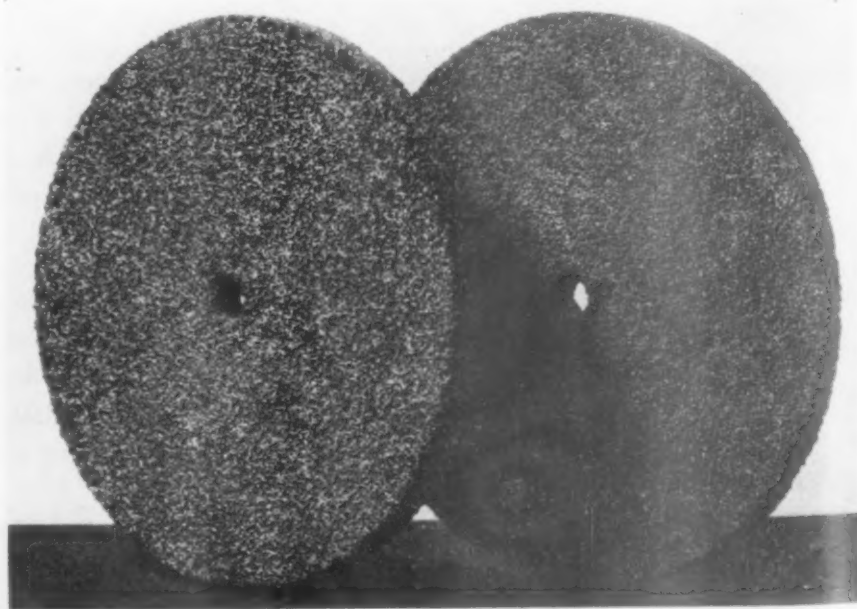
What kind of bonds do we use for holding abrasive grains in place? If the grinding wheel is of the vitrified type, the bond is a glass. If the bond is synthetic resin, the wheels are

known as resinoid or Bakelite wheels. The bond in rubber-bonded grinding wheels is hard rubber. Shellac and also sodium silicate are used as bonds in other classes of abrasive products. In sandpaper, glue is generally the adhesive constituting the bond.

As is well known, rough abrasive operations are generally carried out with grinding wheels in which the abrasive grains are relatively coarse, say number 12 or 16 grain size. This size refers to the approximate screen size through which the abrasive grains are prepared in manufacture, being the number of meshes per linear inch. These grain sizes may be considered as being approximately the number of abrasive grains which, if placed side to side just touching one another, would together stretch out for a distance of just one inch.

### Precision Grinding

Precision grinding is usually carried out with abrasive products of number 46 or finer grain size, and for extremely fine finishing, sizes as small as number 500 or 600, or even especially prepared material such as levigated alumina may be employed. However, it is an interesting fact that by proper dressing of a grinding wheel of number 46-80 grain size range, it is possible to produce extremely smooth surfaces such as are ordinarily associated with very fine abrasive grain sizes.



Coarse grain size Alundum Vitrified grinding wheels. Wheels with small grain size are similar except for the size of the abrasive grains and the pores which make such wheels appear more dense to the eye.

## Abrasive Operations

Abrasive operations that are of importance in connection with production of smooth or relatively smooth surfaces may be classified as follows:

(1) *Ordinary grinding*: For precision operations, this is usually carried out with vitrified wheels in the grain size range 46-120 grit. The precision obtainable depends pretty largely on the grinding machine that is used and its condition. The finish obtainable depends on a number of factors, the most important being the condition of the wheel face as left by the diamond or other dressing tool. Rough dressing with star cutters made of steel gives a rough surface on the wheel and on the work. Smooth dressing with a diamond gives a smooth wheel face and a smooth surface on the product being ground. The rigid holding of the abrasive grains by the vitrified bond glass permits maintenance of

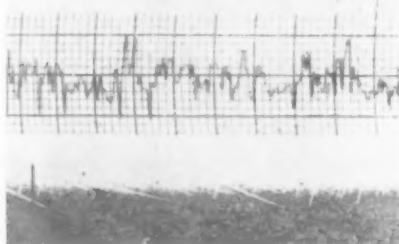
Surface lapped with loose abrasive. Profilometer reading equals three microinches.

Brush Surface Analyzer Curve.

Magnification:

Vertical 2,500 X. Horizontal 100 X.

Lapped, 3  $\mu$  in.  
R-92 4 c



25:1 Taper Section.

Magnification:

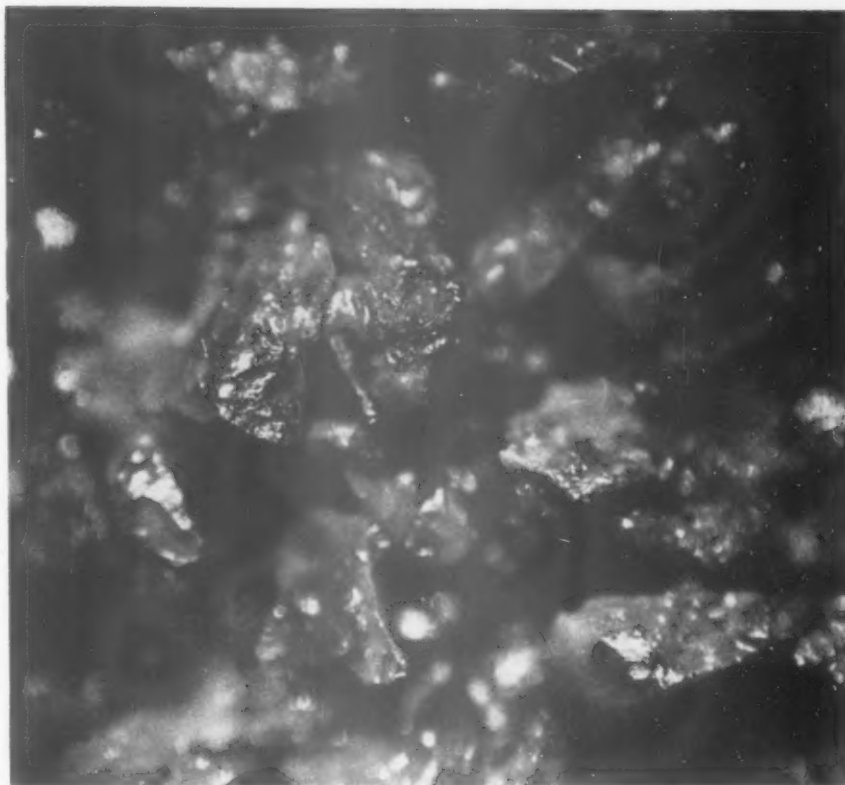
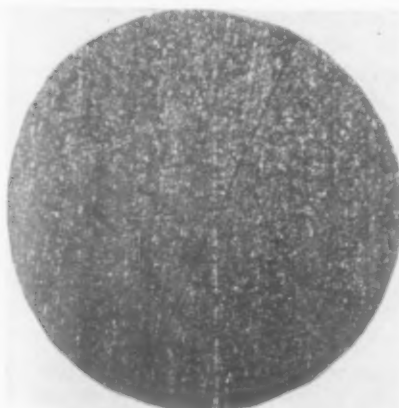
Vertical 2,500 X. Horizontal 100 X.

Black vertical line equals 100 microinches.

The scratches that appear under the cut are merely at an angle to the taper sectioning.

Plan View Photomicrograph.

Uniform magnification of 100 X.



Alundum Vitrified grinding wheel of medium grain size and soft grade which has been used for grinding steel. Interesting in this microphotograph are the projecting abrasive grains which are doing the cutting and the large pore spaces which provide clearance for chips. The magnification is 30 X.

accurate dimensions for the work being ground.

(2) *Fine grinding*: This operation is carried out with organic bonded grinding wheels made with abrasive of fine grain sizes, 320 and finer. The main purpose is to produce smooth surfaces with little emphasis on stock removal, and improvement of accuracy.

(3) *Honing*: Precision honing operations are carried out with vitrified bonded sticks. The broadest application is for finishing internal diameters where sticks in grain size ranging between number 100 and 220 are used for operations classified as roughing and grain sizes 280 and finer are used for finishing. Excellent precision of measurements as well as smooth surfaces are produced by honing.

(4) *Superfinishing*: This is a special type of operation employing vitrified bonded abrasive sticks of fine grain size operated with high speed reciprocation of very short stroke and under light pressures. The purpose is mainly to refine the surface finish, although some improvement in accuracy, such as the removal of chatters, is accomplished.

(5) *"Hyprolapping"*: This is a

trade name used to describe an operation similar to lapping but carried out with bonded abrasive wheels instead of charged laps. A typical wheel would be Crystolon abrasive number 320 or 400 grain size vitrified bond. Also, for producing very smooth surfaces, very fine grain size of organic bond wheels are employed.

(6) *Sandpapering*: This is an operation adequately described by its name. The purpose generally is to produce a smooth surface.

Polishing, either with abrasives or electrolytically, and burnishing are operations used entirely for producing smoother surfaces and are mainly applied for appearance sake. They are rather far away from the Tool Engineer's essential field of interest, usually being hand operations rather than machine tool procedures.

## Importance of Surfaces

Why are we interested in surfaces where appearance is of no importance? For one thing, fatigue failures are related to surface condition and discontinuities. Stresses concentrate at the bottoms of cracks and rough places. Smooth surfaces are more resistant to

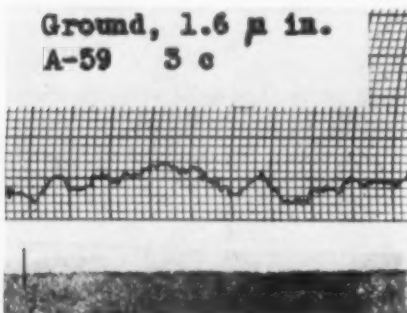
repeated stressing. This is especially important in aircraft applications.

Many of the surfaces to be finished move relative to one another. They are employed in bearings. Frictional characteristics are important in order to keep loss of power at the minimum. Surfaces must be smooth and accurate to be assembled with close tolerances. Wear must be kept at a minimum. Dr. Dayton, of Battelle Institute, classifies the mechanisms of wear as follows:

- (1) *Cutting* due to rough surfaces.
- (2) *Abrasion* due to hard particles from the environment.
- (3) *Corrosion* by chemically active materials in the environment.
- (4) *Galling* due to molecular forces between metals as modified by surface films.
- (5) *Pitting* due to fatigue cracking of promontories on surfaces.

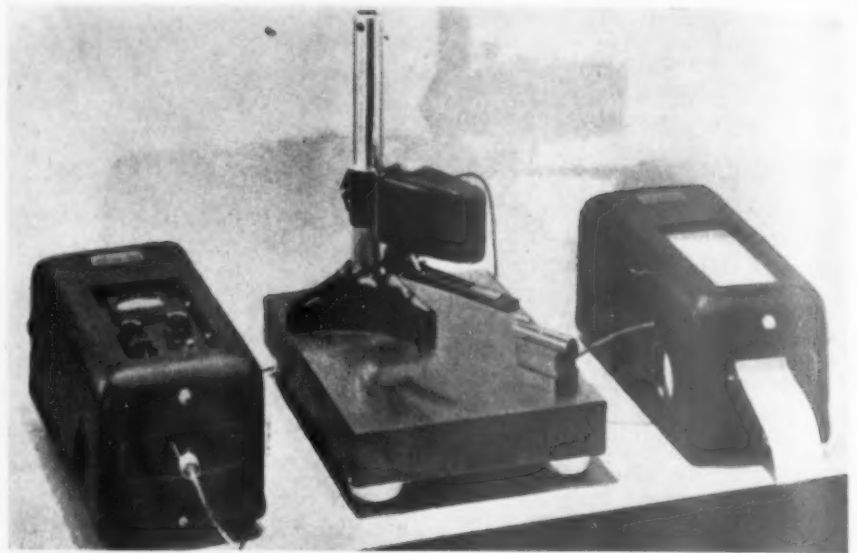
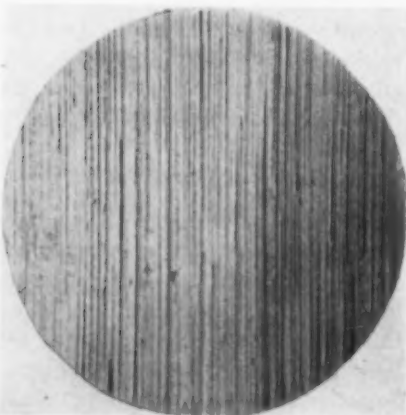
Of these, cutting, galling, and pit-

**Fine Ground Surface of 1.6 Microinches: Profilometer Reading.**  
Brush Surface Analyzer Curve.  
Magnification:  
Vertical 2,500 X. Horizontal 100 X.



**25:1 Taper Section.**  
Magnification:  
Vertical 2,500 X. Horizontal 100 X.  
Black vertical line equals 100 microinches.

**Plan view of Photomicrograph.**  
Uniform Magnification of 100 X.  
Such photomicrographs look much rougher than the surfaces really are due to the particular way that light is reflected from them. Compare this with the normal 90° section of a much rougher surface as shown in figure on preceding page.



**Brush surface analyzer which draws curves interpreting the roughness of metal surfaces. Use of the instrument is described in this article.**

ting are related to surface conditions.

When there is plenty of lubrication and clearance between moving surfaces, the lubrication is said to be of the hydrodynamic type, and under such conditions surface finish is of little importance as affecting the operating characteristics. However, when lubrication is scant or when unit loads are heavy, lubrication is of the thin film type and surface finish is likely to be an important factor as affecting bearing performance.

### Surface Characteristics

Surface characteristics may be classified as of at least two types as follows:

- (1) Large scale irregularities:  
Waves and chatters (spacing equals 0.040" or more)  
Pits  
Defects
- (2) Roughness (spacing of the roughness irregularities is 0.010" or less).

The above classification has been adopted in the proposed American Standard for Surface Roughness as published by the American Society of Mechanical Engineers. The height of both waviness and roughness irregularity is very much less than the corresponding width. Waviness can readily be measured with an ordinary dial gage, and is usually expressed as the maximum peak to valley measurement of the waves.

Roughness is measured by means of a Profilometer and is expressed in terms of root mean square average



**Swarf from grinding on steel. Note the cleanly cut steel chips and shavings from the grinding action.**

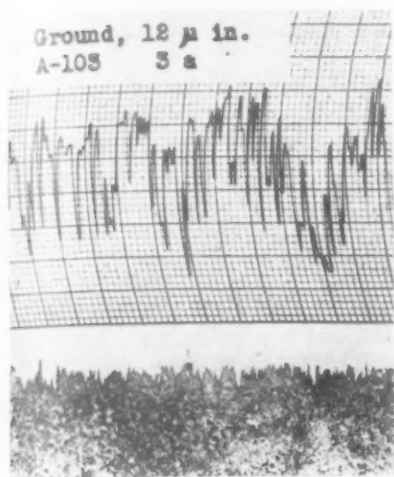
microinches. A microinch is one millionth of an inch. There are thus 1000 microinches in one thousandth of an inch. The use of the root mean square average measurement is merely a convenient unit because the particular electrical instrument commonly employed for making this measurement reads in terms of this kind of an average.

This need not be confusing since the roughness expressed in microinches is merely this particular kind of a number as interpreted with a particular tracer point moving over the surface. Furthermore, a curve representing characteristics of the surface roughness can be obtained by means of the Brush Surface Analyzer.

Attention is called to the fact that both the Profilometer roughness and the Brush Surface Analyzer curves represent interpretations of the surface roughness in terms of a particular tracer point moving over the

**Ground surface of 12 microinches  
Profilometer reading.**

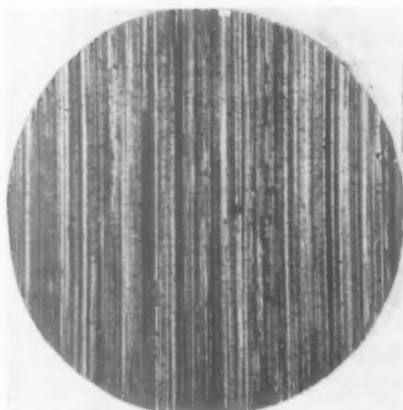
Brush Surface Analyzer Curve.  
Magnification:  
Vertical 2,500 X. Horizontal 100 X.



**25:1 Taper Section.**

Magnification:  
Vertical 2,500 X. Horizontal 100 X.

**Plan view photomicrograph.**  
Uniform Magnification of 100 X.



surface, and this interpretation is also influenced by the nature and characteristics of the pickup unit and electrical circuits employed. With extremely fine surface irregularities, the radius of the end of the tracer point (usually 500 microinches) does not permit it to completely follow the surface over which it passes. Although these instruments give reproducible results and are most useful and serve for commercial applications very satisfactorily, one should never consider that the readings obtained or the curves drawn are absolutely accurate values or are true pictures of the surfaces. They are merely interpretations made under certain standard conditions as limited by the tracer point, pickup, and electrical circuit

characteristics.

The ideal manner by which to show surface roughness in a way that everyone can readily understand is to cut a section through the piece perpendicular to the surface, doing the cutting, in such a way not to alter the surface irregularities or roughness. Then a photomicrograph of this ordinary "normal section" shows the irregularities.

But for purposes of study, the height of the waves and roughness is so small relative to the spacing between adjacent hills and valleys that this method does not permit sufficiently accurate observations to be made of the nature of the contour. If extremely high magnifications are employed in order to get height measurements that are significant for smooth surfaces, then length of the sample obtained along the surface is so small that the observations are inadequate for the intended purpose.

**Make Taper Section**

The way to avoid these difficulties is to make a "taper section" instead of the "normal section" just described, thus obtaining considerably more magnification of the surface roughness in a vertical direction, and still getting an adequate length of surface

for examination. Such a taper section makes the surface have an exaggerated appearance but permits an accurate study of the surface irregularities.

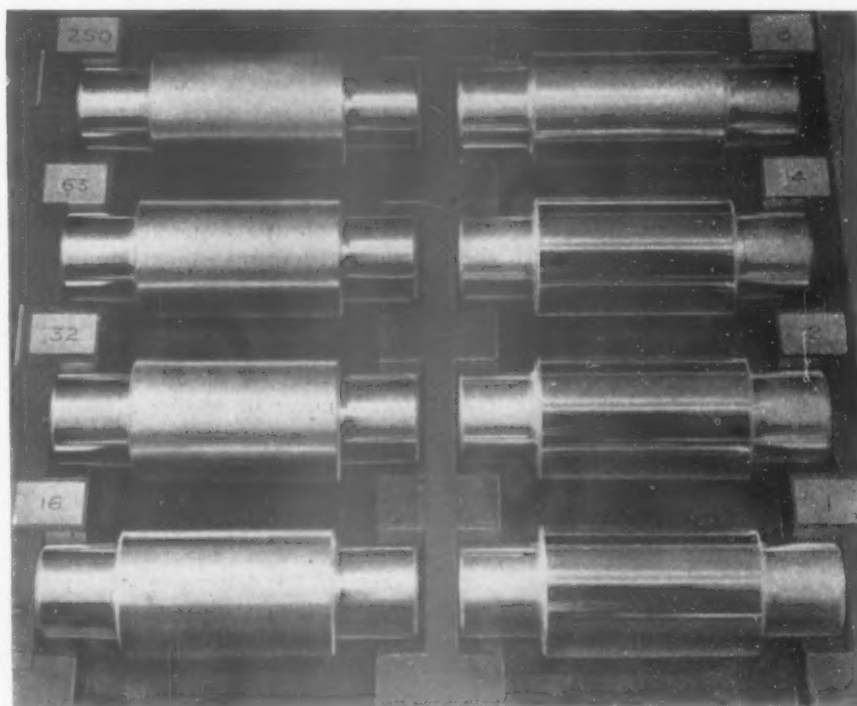
The technique of making such taper sections has been worked out at Battelle Memorial Institute and published by Dr. H. R. Nelson in the Proceedings of the M.I.T. surface finish conference held in June 1940. This has proved a most useful tool in surface roughness studies, but of course cannot be used for commercial measurements since it is not only expensive and time-consuming but also destroys the surface being measured.

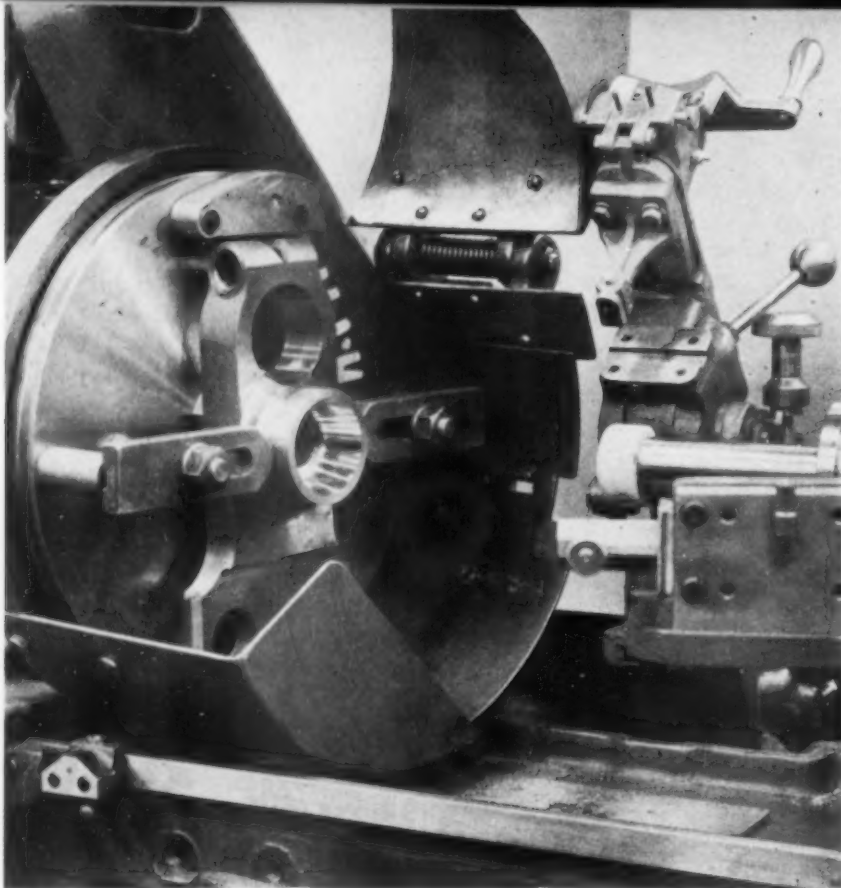
**Standard Surfaces**

For approximate commercial evaluation of surface roughness, another procedure is merely to make comparisons with standard surfaces of known roughness. These comparisons may be by visual examination accompanied by feeling the surfaces with the fingernail. Although this method depends upon the skill of the operator, nevertheless it has been found to be quite satisfactory in many cases for shop use. Standards for this purpose have been made up by some of the companies using this method.

**Display of Norton Company cylindrical standards of surface roughness  
for ground surfaces.**

Profilometer readings of 1, 2, 4, 8, 16, 32, 63 and 250 Microinches.





Grinding aircraft crankshaft taper, radius and face on Heald machine.

## ON THE PRODUCTION FRONT

**"INTERNAL GRINDING"** is from a thesis prepared to complete an apprentice training course. It was granted an award by the school in a contest judged by the Cleveland Chapter of the American Society of Tool Engineers.

It is published as part of an editorial program prompted by Tool Engineers who feel that such material can be helpful to the thousands of men, young and old, who contribute to the war effort with all the energy they possess.

# Internal Grinding

ALLEN E. LEPLEY

**I**NTERNAL grinding is a precision method of finishing holes in all kinds of materials. It economically produces the very accurate sizes and fine finishes which are required in modern manufacturing practice.

Internal grinders are of three basic types; chucking machines, in which the work to be ground is held in a chuck which rotates it; centerless internal grinders, in which work, such as bushings, is rotated between rolls; and planetary grinders in which the work is clamped stationary while the grinding wheel is revolved about the centerline of the hole being ground.

All internal grinders have one thing in common, however, and that is the grinding wheel which is the heart of every grinding machine. Upon it rests the success of the grinding operations done on machines costing many thousands of dollars.

### Choosing the Properties

To determine the proper wheel for a given job thorough consideration of several items will result in choosing a

satisfactory one, or at least point the way to the ideal one.

First, consider the material to be ground. Hard, dense materials resist the penetration of the abrasive grains, causing them to dull quickly, and therefore must be ground with comparatively soft grade wheels which permit their grains to fracture or break away easily when they become dull.

Hard, brittle materials, since the penetration of the individual grains is so light, generally require a relatively close spacing of the grains or a dense structure. Also a fine grit size wheel may be used. On the other hand, soft, ductile materials require a relatively wide spacing of the grains, or open structure, to permit them to penetrate to the maximum depth and also to give sufficient chip room for the large chips produced.

Second, the amount of stock to be removed, the accuracy, and the finish required must be considered.

A coarse grain wheel with an open structure should be chosen when a

large amount of stock is to be removed.

A fine grain wheel is chosen for fine finish and accuracy. Since with a fine grain wheel, the individual pressure upon the work of each grain is less than in a coarse wheel, it will spark out or stop grinding more quickly when the feed is stopped as there is less spring in the work.

Third, the area of contact between the wheel and the work must be considered, as the greater it is, the larger is the area over which the pressure between the wheel and the work is distributed.

When this area is large, the wheel should be of relatively coarse grain and open structure, since this means that there will be fewer grains in contact with the work at once and therefore, the pressure upon each individual grain will be sufficiently great to fracture it when it becomes dull.

It is of interest to note that in internal grinding, the area of contact is always much larger than in surface and external grinding.

Fourth, the condition of the grinding machine itself must be considered, as an old, worn machine requires a somewhat harder wheel than a new machine.

Fifth, and finally, the relation between the wheel and work speeds must be remembered. The higher the

work speed is in relation to the wheel's speed, the heavier will be the chips removed, and the more rapid will be the wear on the wheel. Therefore, a harder grade wheel will be more satisfactory for this work.

### Grinding Wheel Operation

Cutting action is affected considerably also by factors which may be controlled on the grinder itself, such as work speed, traverse rate and wheel speed. All these factors have the effect of altering the size of the chip cut from the work by each abrasive grain, thus varying the stresses placed upon them. If we choose a wheel which glazes and becomes dull rapidly, we consider it a hard acting wheel and force it to remove heavier chips, thus increasing the strain upon its grains and overcoming its tendency to act hard. If, on the other hand, we choose a wheel which wastes away and requires too frequent truing, we consider it a soft acting wheel, and cause it to remove smaller chips, thus decreasing the pressure upon its grains and permitting them to stand up longer.

Control of the chip size is of primary importance. This action is greatly exaggerated in Figure 1 to illustrate this importance.

### Choosing the Wheel Dimensions

Since internal grinding wheels are relatively small, and are used up rapidly, it is economical to start with the maximum permissible diameter wheel, and continue to use it until it is too small for the job. It must be remembered that, as the wheel diameter is reduced, the arc of contact is reduced, thus concentrating the grinding pressure upon a smaller area of the wheel and causing it to break down somewhat more rapidly than at first.

The length of the wheel varies in relation to the length of the hole being ground. On very short holes, it is best to have the wheel somewhat longer than the hole, while on large holes this would be impractical. Other factors must also be considered. If the hole to be ground has short openings in its side, wheels wide enough to span them will prevent grinding low places adjacent to them. Where the openings are too long for the wheel to span, a narrow wheel will reduce the wheel pressure, thus decreasing the tendency of the wheel to spring away from

the work, and also produce a more accurate hole.

After a wheel has been mounted on the grinding machine spindle, it must be trued and dressed before being used, and periodically thereafter as it becomes dull or wears out of shape.

### Coolants

Internal grinding may be performed either wet or dry. These coolants are mixtures of soaps and oils in water. They must remove heat rapidly, wash away the chips and fractured grains, reduce the friction of grinding, improve the finish, and prevent rust. They should not have an unpleasant odor, but should contain a disinfectant so that they will not infect the cuts which all operators are likely to receive.

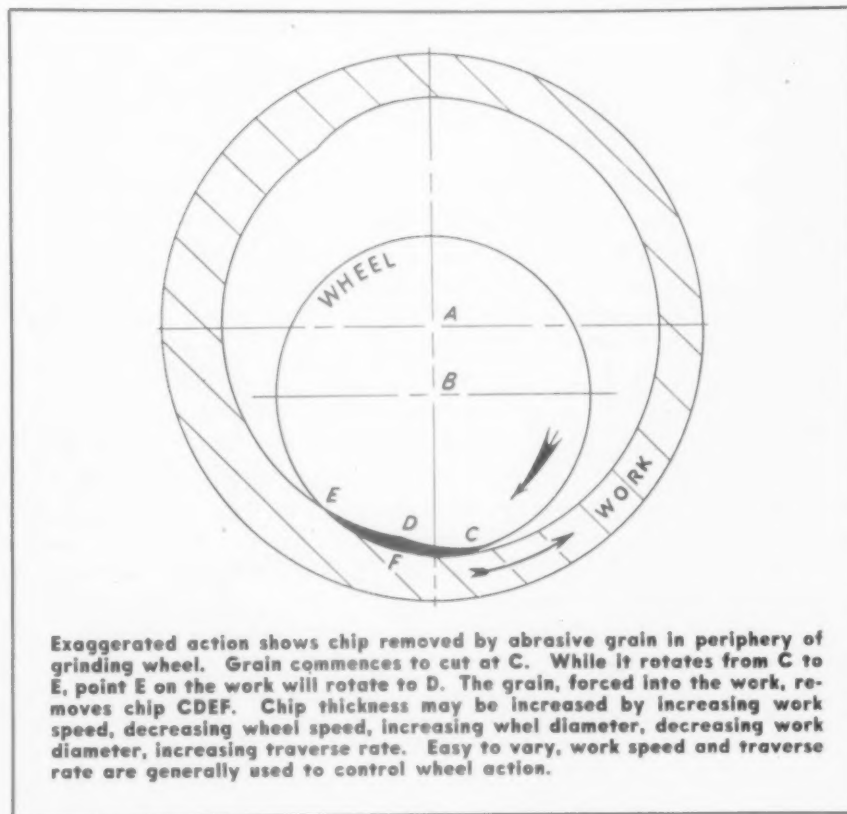
The heat generated by grinding causes several difficulties if it is not removed. It tends to make the wheel glaze over rapidly and refuse to cut. It distorts the work so that it is not ground true, and causes it to burn and check on the surface giving a mottled appearance. It also makes it difficult to gage without waiting too long for it to cool. Therefore, a coolant which keeps the work cool by constantly removing the heat from it is very desirable. This is particularly important when grinding work having thin wall sections which cannot

absorb very much heat. Besides removing heat from the work, a coolant also tends to reduce the amount generated by lubricating the wheel and work.

A coolant should always be used when grinding hard materials. To obtain the best results on these, a lubricant of the soap type, which spreads out over the surface of the work and wets it, should be used. This gives the wheel greater freedom in cutting and permits quicker stock removal.

A coolant is also required to wash the chips out of the wheel to prevent its loading. It also prevents these chips from scoring the work. If, however, too dirty, it may carry the chips back to the wheel and cause scoring. The use of coolant is particularly important in this respect when grinding the softer, tougher materials such as brass and bronze. Aluminum, especially, due to its tendency to tear, must be ground with a coolant having a strong penetrating action, such as kerosene.

Finally, the chemical action of the coolant on the bond of the wheel must be considered. Vitrified bonds are not affected by either soaps or oils. On the other hand, soaps affect silicate, resinoid and shellac bonds, while oils affect rubber bonds.



## Eleven basic jobs must be learned for successful operation of three types of internal grinders

**T**HERE are three basic types of grinding machines. However, each of these machines has the same basic operating principle. Let us take them up in the general order in which they would present themselves in grinding a job.

First, the grinder hand must carefully check the work to be ground, so as to be certain that there is sufficient grinding stock on it.

Second, that part should be chucked in the machine and properly trued. When chucking the part, care must

be taken not to distort it. Also the chuck must be properly counter-balanced. Most production machines are equipped with special holding fixtures which are rapid loading, and which hold the work in such a manner that a minimum of distortion occurs. Often when work is to be held in chuck jaws, the jaws themselves are ground in place on the grinder while under clamping pressure against a disc at the back of the jaws. In this way it is possible to chuck work very accurately. When the dimensions are located from one end, the work is generally held in a draw back collet, which, as it closes, draws the work back against an internal stop. This stop is often ground in place on the machine before using.

Third, select the quill upon which to mount the grinding wheel. The proper quill is the shortest and strongest one available which will operate satisfactorily in the hole to be ground. The shorter and stronger it is, the less it will spring away from the work or whip about, and the quicker it will remove stock. However, too large a spindle may not be satisfactory as it will prevent the grinding wheel from being worn down sufficiently to be economical. Therefore, the proper spindle is the one which gives the quickest stock removal with economical wheel life. Also notice that as the spindle increases in length, it must be increased in diameter, and that therefore, the longer the hole being ground, the less economically the job can be done.

Fourth, mount the wheel upon the spindle. Be careful that the hole in the wheel is of the proper diameter so as to slip onto the spindle or screw easily, for if it must be forced on, it is likely to crack when the screw expands slightly from heating. Washers of blotting paper must be used on each side of the wheel to distribute the clamping pressure evenly. This is an important safety precaution as it may prevent a fracture. When grinding blind holes, the screw which holds the wheel onto the spindle must be in a counterbore in the wheel so that the head will not bump the end of the hole.

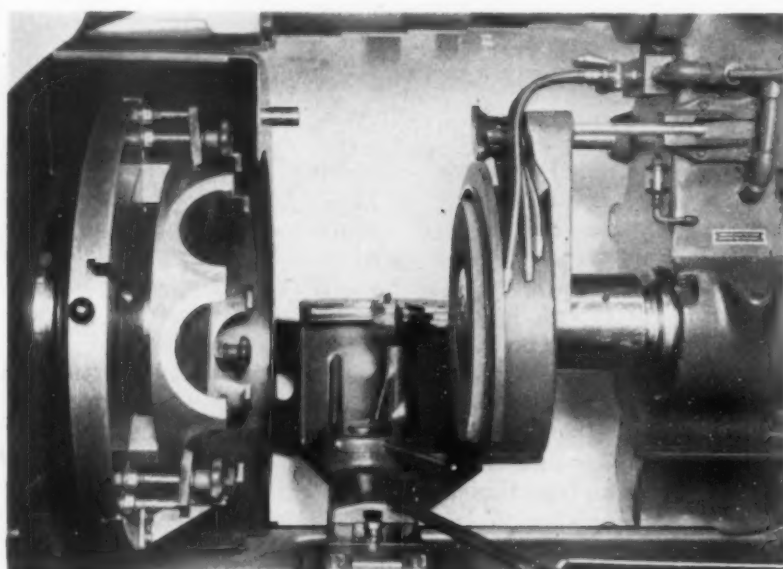


Photo courtesy of The Bryant Chucking Grinder Co.

Grinding the walls of radial type crankcases to reduce the danger of fatigue cracks is an operation requiring a rugged machine to remove a considerable amount of stock with a rather large wheel.

Dressing the wheel accurately to shape by the use of a diamond is one of the interesting problems connected with this job. The photo shows the dresser used for the truing operation in its operating position. The grinding wheel, however, is shown to the right of the dressing position. The diamond bit is mounted in a small sliding block on the horizontal center line of the wheel and is carried on a supporting casting which is pivoted on a vertical axis, located below the wheel and at some distance from its center. The curved guide member shown in the photo controls the sliding motion of the block carrying the diamond bit as the supporting casting is turned by means of a worm and gear. Convenient stops are provided to position the wheel accurately for dressing and grinding.

In order to reach some portions of the surfaces the machine is arranged so that the workhead can be swung around at an angle and in some cases it is necessary to swing the wheel spindle around at an angle also to clear the bosses which carry the crankshaft bearing. In some cases, the in-feed is in a direction parallel to the length of the machine and a hydraulic device is furnished to provide a traversing motion within limits determined by two cross feed screws.

Fifth, adjust the wheel speed if this can be done on the particular grinder being used. Although the grinding action of the wheel may be altered by a change in wheel speed, in practice it is found best to operate the wheel at its normal surface speed, as recommended by its manufacturer. This is important, as too slow a speed means wastage of abrasive without much useful work in return, while an excessive speed results in hard grinding action and is dangerous as the wheel may explode from centrifugal force. Common surface speeds in internal grinding vary between 2,000 and 6,000 feet per minute, generally being nearer the high limit. At no time, however, should the wheel be operated at a higher speed than recommended, or at a higher speed than that for which the wheel head was built. Should the spindle have a tendency to whip at high speed, the wheel must be slowed down slightly. Notice that in most grinders, the wheel rotates in a clockwise direction when looking toward the head stock and that it grinds on the surface of the work farthest from the operator. Also notice that the chips cut by the wheel are thrown in a downward direction.

Sixth, properly true and dress the wheel.

Seventh, adjust the work speed approximately. The final adjustment will depend on the wheel action, as this is the principal way of controlling it. Notice that the work rotates in a counter-clockwise direction.

Eighth, adjust the length and rate of the traverse stroke, which is the movement of the wheel lengthwise of the spindle. The length is adjusted by setting trip dogs on the table, so as to trip a reversing lever at the proper moment.

On open end holes, where the work is wider than the grinding wheel, the wheel usually protrudes from the hole a distance of one-quarter to one-half the width of the wheel at each end of the work. On open end holes where the wheel is wider than the work, the wheel usually remains in the hole a distance of three quarters to one-half of the work. On closed end holes, the wheel should project as far as possible beyond the relief at the bottom, and an equal distance at the open end.

Notice that the wheel is not withdrawn from the work at each pass.

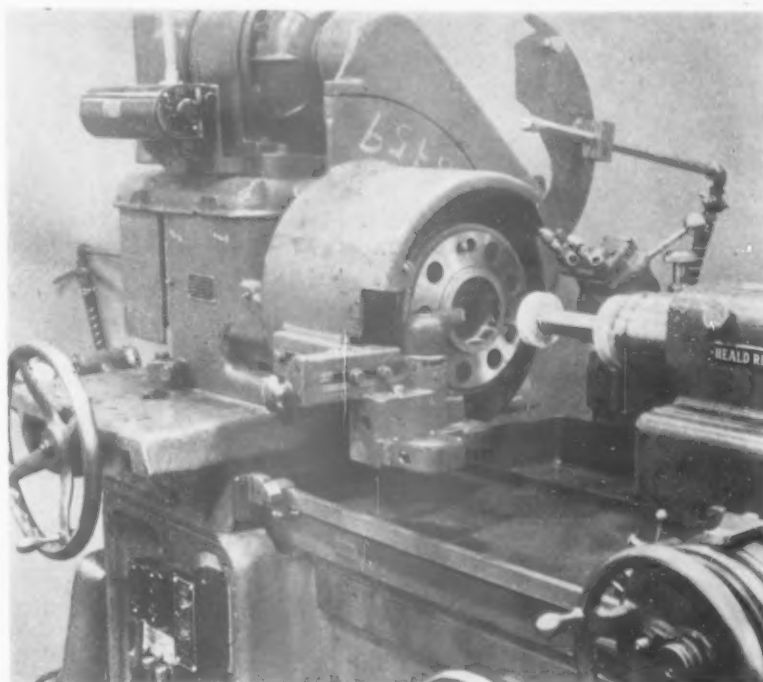


Photo courtesy of The Heald Machine Co.

Propeller cams are successfully ground with two wheels mounted on the same quill of a single wheelhead. The cam has two bores at either end ground by the double wheel method, 3.750-inches diameter and 4.675-inches diameter. About .010-inch to .015-inch is removed from each bore.

The cam is held in a pot type fixture from a bevel at the rear and a shoulder at the front by two locating plates front and rear, the front locating plate also serving to clamp the cam endwise by means of studs and nuts.

A dial indicator sizing device attached to the front of the chuck guard is used to indicate size of the front 4.625-inch diameter bore. When this bore reaches size, the 3.750-inch bore also reaches size, since both wheels are trued to a definite relationship. The machine is also furnished with a double diamond truing device and a workhead cross-slide with four position dial indicator barrel stop.

This keeps the wheel from digging into the ends of the hole when the area resisting the grinding pressure is reduced, thus preventing the work becoming bell-mouthed or larger in diameter at the ends. However, when it is withdrawn at the finish of the grinding, it should be quickly fed away from the work just at the end of a stroke, before removing it from the hole.

Ninth, rough grind the hole. Start the wheel, the work, and the traverse movements. Turn on the coolant and bring the wheel into contact with the work. Next feed the wheel into the work at each traverse, either by hand or automatically. This movement is

called the "infeed." It should seldom be more than one or two thousandths of an inch, depending on the size of the wheel and work. Bring the hole to within a few thousandths of size.

Tenth, redress the wheel if necessary.

Eleventh, finish grind the hole to size and check with plug gage. Use care not to freeze the plug gage in the hole, however, as when a cold plug is placed in a hot piece of work, the work tends to shrink and bind the gage. Due to the difficulty experienced in gaging a hole which is wet, many internal grinding operations are performed dry which otherwise would be ground wet.

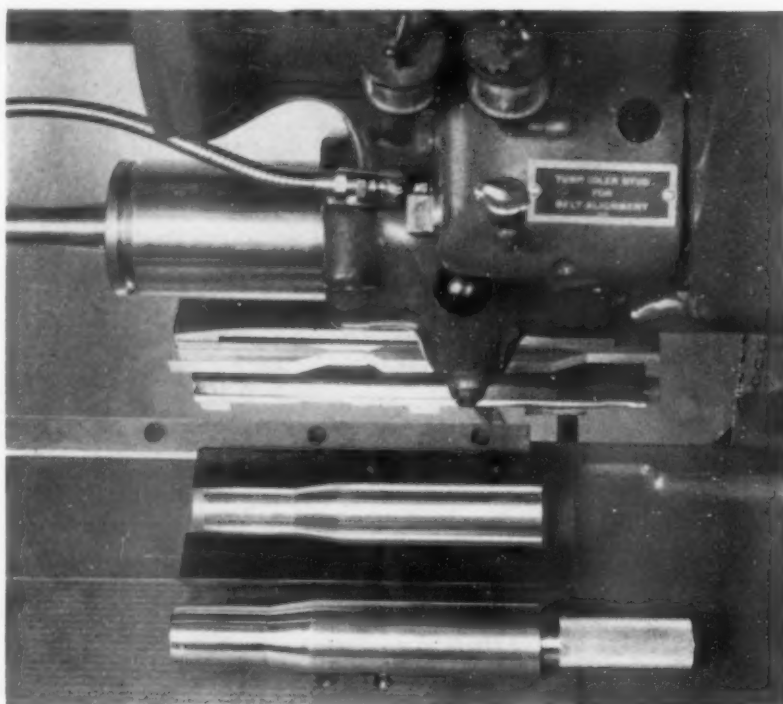


Photo courtesy of the Bryant Chucking Grinder Co.

Grinding a cartridge chamber involves the use of special formed control plates to guide the grinding wheel along the four tapered portions of the chamber and their connecting arc. The photo shows the two formed control plates and a half-section of the gun chamber with a plug gage for testing.

Two operations are performed. One is to grind the outer and second taper, the other for the third and fourth. Two feed screws and two control plates are provided with removal projections of suitable length to reach the tapers ground at each operation. A portion of each control plate is devoted to dressing the wheel to the proper shape to match the tapers being ground. In this case, there are two tapers generated on each wheel by the dressing operations.

The gun barrel is mounted on a chuck at each end of the hollow work spindle, the muzzle being permitted to extend from the end of the machine. In setting up the machine for trial it is customary to provide a dummy made up in two parts, divided longitudinally and separated by two thin pieces on opposite sides. Grinding the two halves with the separating shim as a unit makes it possible to check the bore with the taper gage shown. And by separating the parts it is possible to inspect the blending of the several surfaces. If desired, one of the thin pieces can be checked for contour on a comparator.

In the chucking type of internal grinder the work is held in a three or four jaw chuck, or on production machines, in a quick acting, holding fixture. It is rotated on the work spindle in line with the traverse motion of the wheel. On some machines, however, the work head may be swiveled, so as to grind tapered holes.

The grinding wheel head is mounted on a slide which may be

moved cross-wise to the axis of the work so as to feed the wheel into it. This feed may be very closely controlled so as to obtain accurate sizes. The wheel head is belt driven at a very high speed required to give the desired surface feet to the wheel. On some internal grinders, several wheel heads are interchangeable so that one which was designed to operate at the speed required may be used.

The traverse motion is obtained on various makes of grinders in two ways. Either the work head or the wheel head is mounted on the main table of the machine. The rate of traverse can be closely regulated, and is often hydraulically operated.

On an automatic internal grinder used for production work, the operator is simply required to load the machine and throw over the starting lever. When the starting lever is moved, the wheel enters the hole at a rapid travel from its rest position, and is brought into contact with the work after entering it by a pick-up feed. This prevents the wheel from breaking down on its leading edge as it enters, and helps prevent trouble from irregular grinding stock.

The feed then changes to the proper roughing feed and traverse and semi-finish grinds, thus relieving the spring of the grinding spindle which was caused by the roughing feed. Then the wheel is automatically withdrawn and trued and dressed. It again re-enters the hole and finish grinds it at the proper feed and traverse rate until the proper size is obtained. Finally the wheel feed backs it off from the work and then the wheel withdraws to rest position. This prevents bell mouthed work and the possibility of scratches.

With one type control, the size is obtained by roughing the work almost to size in the predetermined number of strokes, then dressing the wheel with the diamond set an exact distance from the centerline of the work and finish grinding to size by automatically infeeding the wheel during a definite number of strokes, a distance equal to the difference between the radius of the finished hole and the distance the diamond is set from the centerline. This control may be used for either through or blind holes.

Another type control gives the same automatic control to the grinder, except that it continues to rough grind the hole until a roughing size gage which is repeatedly testing the hole at its inside end, enters it and causes the grinder to dress the wheel and start to finish grind. It continues to grind until a finish gage, which is mounted just behind the roughing gage, enters the hole. This causes the grinder to return to loading position. Since the hole is being gaged at its inside end, it must be a through hole.

On another type of chucking inter-

nal grinder the wheel head and its motor drive are suspended from a large diameter overhead bar directly above the work spindle, and parallel with it. The wheel is traversed by sliding this bar through its supporting bearings, while the infeed is obtained by swinging the wheel head sidewise about this bar. This grinder can thus be adapted to grinding of out-of-round holes, as a cam which is mounted on the work spindle may be easily linked to the wheel head so as to properly swing it sidewise on the bar at each revolution of the work. This grinder is also readily adapted to grinding both a hole and a face on the work at one chucking, thus securing very square grinding spindles and wheels on the same wheel head and swinging the head sidewise to bring each wheel into position as required.

### Centerless Internal Grinder

The centerless internal grinding machine is used for grinding the inside diameter of bushings or other work having a cylindrical outside diameter which is concentric with the hole being ground. The work is rotated between three rolls, the regulating roll driving it. This method of holding the work has advantages.

First, it is very easy loading and adapts itself to automatic loading. In automatic loading, the piece which is finished is pushed up over the top of the regulating roll by the loading arm.

Second, it assures perfect concentricity of the hole with the outside diameter of the work. This means that the work may be easily rechucked to do additional operations.

Third, since the work is well supported along its entire length, it is rigid and permits perfect wheel action.

Of two machine styles, one maintains the centerline of the work exactly level with the centerline of the regulating roll and the grinding wheel. This causes the regulating wheel to support the work exactly opposite the grinding wheel and is therefore used for grinding work with extremely thin walls so as to prevent distortion. The other style machine, keeps the horizontal centerline of the work considerably above that of the regulating roll. This permits very accurate hole sizes being obtained, even though the outside diameter of the work varies considerably as the rolls from a roller V-block.

The planetary type of internal grinder is used for finishing work, which due to its size, or shape cannot be revolved about the centerline of the hole being ground. Instead, the work is clamped solidly to the table of the grinder and the table merely moves parallel to the spindle so as to give the traverse motion. This table may be adjusted crosswise to center the hole with the grinding wheel center of rotation. It may also be ad-

justed vertically.

The grinding wheel must be revolved about the centerline of the hole being ground, while at the same time it is rotating at the high speed required. This is accomplished by the use of an eccentric while the feeding of the wheel into the work is done with a second eccentric within the first one, which when rotated slightly, causes the radius of the wheel revolution to be increased.

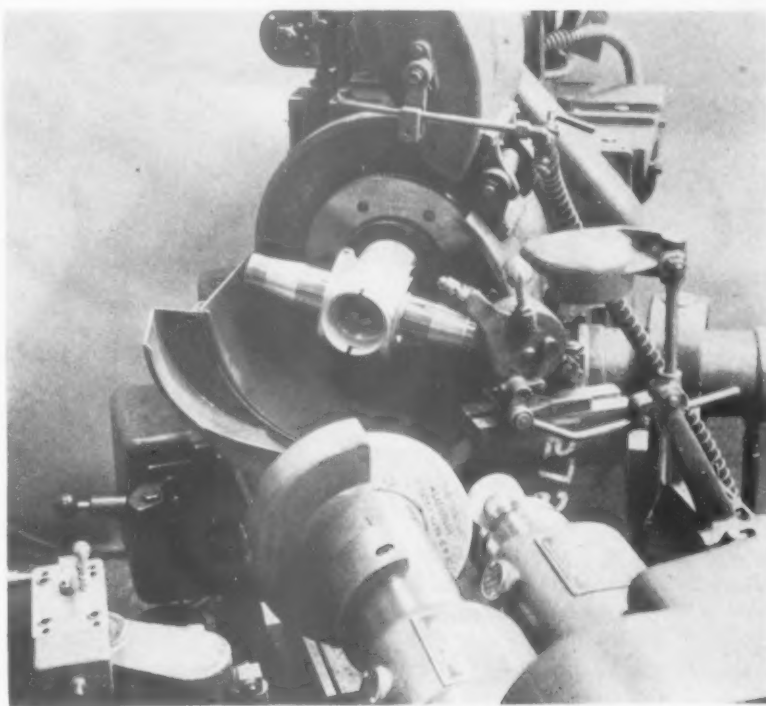
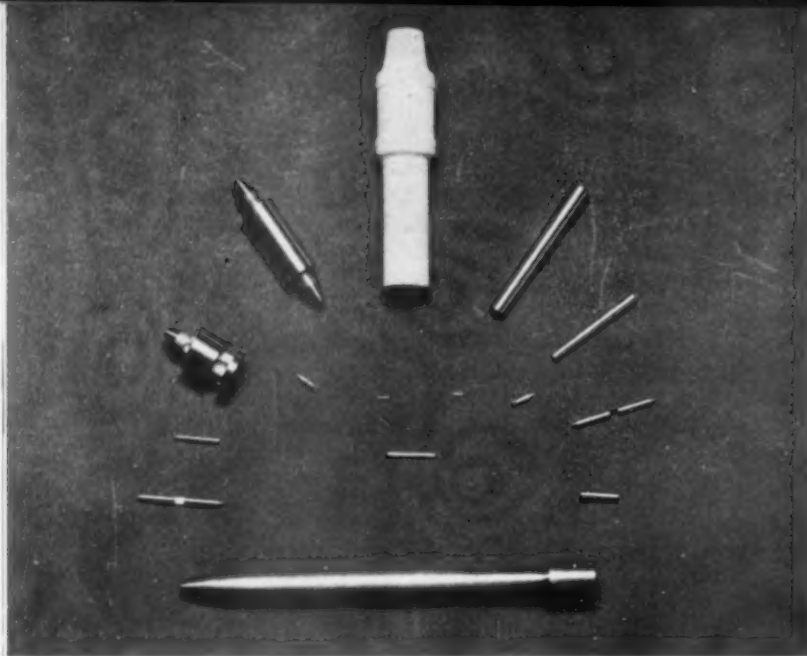


Photo courtesy of The Heald Machine Co.

Two wheelheads obtain perfect squareness between an internal taper and the external face in both ends of aircraft propeller spiders by grinding both bore and face in the same setting. In addition, a 30 degree taper bore is ground inside the part at one end, and a 15 degree taper bore at the opposite end.

First operation is to grind the 30 degree taper in a reciprocating cut, using the rear wheelhead. Then the table is run out and the workhead swivel is swung to a 15 degree angle. Next, the table is run in again, and the outside face is ground, using the front wheelhead in a plunge cut and a cam facing attachment for feeding the table. The cutting face of the wheel on this wheelhead is trued to a 15 degree angle which will produce the desired squareness of face to bore. This completes the operations on one end of the part and the part is reversed on the stake. Next the 15 degree taper bore is ground. Final operation is to grind the face on the end of the part.

The machine has the workhead mounted on a hydraulically operated swivel which permits rapid angular positioning. The small wheel grinds the taper bores, and the other plunge face grinds the external surface. A conventional diamond trues the O.D. of the small wheel and a special hand operated device trues the face of the large wheel.



## ON THE PRODUCTION FRONT

**A**N endless variety of parts for war are being mass produced in the manufacturing arsenals of the country with centerless grinding.

Spark plug cores, steel punches and intricate instrument parts, shown here, are vital war-time applications. An understanding of fundamentals was required to do such jobs.

# Centerless Grinding

GARY F. HECKMAN

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CINCINNATI MILLING AND GRINDING  
MACHINES, INC.

**T**HE principal elements of a centerless grinding machine are the grinding wheel, regulating wheel, and the work rest. The work rest incorporates suitable guides for leading the work to the wheels and receiving it therefrom, as well as proper means for supporting the work during the grinding cut. The above named elements may be arranged and combined in a number of different ways, but the fundamental principle involved is the same in all cases.

The action of the grinding wheel forces the work against the work rest because of the cutting pressure and against the regulating wheel because of what may be called the cutting contact pressure. The pressure, aided by the gravity component of the work, keeps the part being ground in contact with the regulating wheel. This wheel, which is usually made of material similar to that of the grinding wheel, provides a continuously advancing frictional surface insuring constant and uniform rotation of the work at the same peripheral velocity as that of the regulating wheel.

One can readily understand how work is ground round on a center type grinder. The centers determine an

axis of revolution and the rotation of the work, together with its rectilinear movement relative to the grinding wheel face, or vice versa, cause the generation of a cylindrical surface. The diameter of this cylinder is governed by the distance between the line

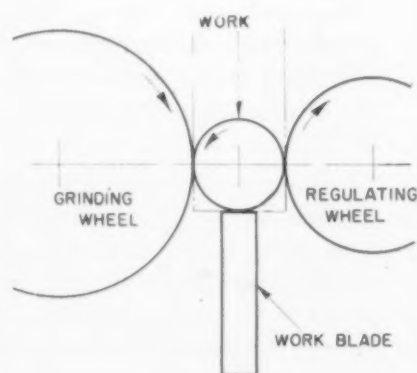


FIGURE 1.

of the centers and the face of the grinding wheel.

On the centerless grinder there are no centers, and apparently no method of controlling the roundness of the work exists. It is evident that the ground diameter of the part is determined by the distance between the

two active surfaces of the wheels, but a constant diameter does not necessarily mean a perfect cylinder. In order to relate the subject of controlling the roundness of the work on the centerless machine in a clear and readable way, the influencing factors are considered as follows:

The simplest case is considered first. The center of the work is in line with the centers of the grinding and regulating wheels. (Figure 1) The flat top work supporting blade is used. The surfaces of the wheels together with the blade form three sides of a square.

Any high spot on the periphery of the work coming into contact with either grinding or regulating wheel will produce a diametrically opposite concave spot. (Figure 2) Grinding with this set-up results in work of constant diameter but not cylindrical. An extreme case of the shape generated by this method is shown in Figure 3, and is known as the three arc triangle, having a constant diameter, but not round.

Now, if the center of the work is elevated above the centers of the wheels by raising the supporting blade, a low spot coming in contact

with the regulating wheel will cause a high spot to be generated at the contact with the grinding wheel, but not diametrically opposite. As the piece being ground is rotated, the high and low spots will not come opposite to each other, as was shown before, and a gradual rounding up effect is thus obtained.

To attain maximum corrective rounding up action, use has been made of a blade with angular top as shown in Figure 4. This produces distinct corrective phenomena which is diagrammatically illustrated in Figure 5. Two lines, A-A and B-B are drawn tangent at the points of contact of the work with the wheels, and another line, C-C, shows the plane of the angular top of the blade. If a low spot on the work comes in contact with either the blade or the regulating wheel, as in the case of the part shown in dotted lines, the approximate center of the work will be lowered.

### Work and wheel centers

With the centers of both wheels being fixed, the smallest diameter can be generated on their center line. The lowering of the center of the work towards the center line of the wheels causes the reduction in the diameter of the ground piece. Conversely, any increase in height of the center of the work above the center line of the wheels causes generation of a correspondingly larger diameter.

Thus the grinding wheel, instead of leaving a high spot on the periphery of the work equal to the depth of the concave spot at the contact with the regulating wheel, generates a proportionally smaller high spot at its contact with the work. In this manner, low and high spots "dampen" themselves out, theoretically approaching cylindrical shape in infinity, but in actual practise, cylindrical form is obtained in a short time.

### Achieving cylindrical form

For the above reason, fastest rounding up action is obtained with high angular velocity of the work, which is controlled at will by increasing the speed of the regulating wheel.

This corrective action is very complex and depends upon many involved variables, such as the inclination of the blade top, included angle (OC)

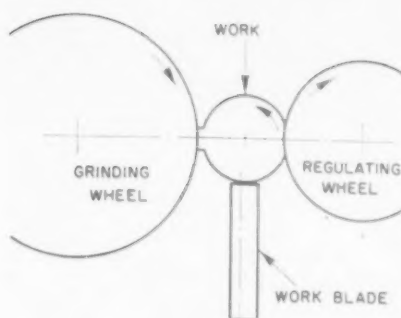


FIGURE 2.

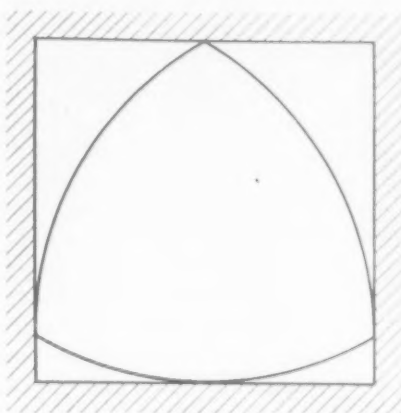


FIGURE 3.

between the two tangent lines, etc. Experience proves conclusively this corrective action — if a light cut is taken on a part very much out of round, for example .010-inch or .012-inch, only the high spots will be ground, and from the very first spark the machine starts to generate the largest true cylinder which is possible to form out of the irregular outline of the rough part.

The higher above center the work is placed, the quicker the rounding up action, the limit being when the work is periodically lifted from the blade due to the greatly increased vertical components of the involved forces. This fact is proven every day as the customary remedy of out-of-roundness is higher placement of work, all of which agrees with the theory of corrective action. It is possible to go higher with soft wheels than it is with hard ones. This fact is explained by the decreased contact pressures which in turn reduce the tendency to lift the work from the blade. Naturally, when grinding a part which is particularly hard to round up, work can be placed extra high by using an extra soft wheel.

Contrary to the usual practice on centerless grinding machines, when grinding long work, such as steel bars,

the center line of the work is sometimes placed below the center line of the wheels. By grinding in this position, the whipping or chattering which might result from slight kinks or bends of the bar is eliminated, and the work is held firmly down on the blade, due to the action of the wheels.

All centerless machines employ so-called negative work speed, or in other words, the angular rotation of the work and that of the grinding wheel are in different directions. The grinding wheel revolves at standard grinding speeds approximating 6,000 feet per minute. The operating speeds of the regulating wheel may be varied at will, and range from 38 to 940 feet per minute peripheral speed for a new wheel.

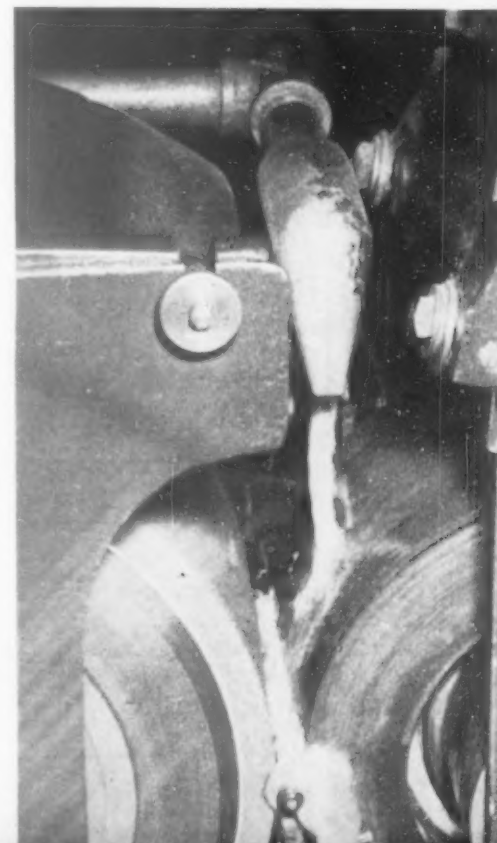
### Summary

The preceding discussion can be summarized in the following general rules:

For quick rounding up action, the work center should be placed as high as possible, the angular velocity of the work should be high, and the rate of traverse (if thru-feed) across the grinding wheel face should be small.

For best straightening out effect of long single diameter work, the cen-

**In cylindrical grinding, the work is supported between points located with reference to grinding centers—an important difference between centerless and cylindrical grinding.**





**Thru-feed method of centerless grinding.**

ter of the piece should be placed below the center line of the wheels and the rate of traverse should be high. Grinding in this position is primarily for straightening the work. Subsequent passes can be made with normal set-up for corrective rounding action.

### Methods of Centerless Grinding

There are two main classes of centerless grinding. These are thru-feed and in-feed. Thru-feed grinding is accomplished, as the name implies, by passing the work through or between the grinding and regulating wheels. Grinding takes place as the work passes from one side to the other. Obviously, since all points on the work pass all contact points between the wheels, only straight cylindrical surfaces without interfering shoulders can be ground by this method.

#### Thru-feed

The axial movement of the work past the grinding wheel is imparted by the regulating wheel.

The machine is arranged in such a manner that the regulating wheel can be swung about a horizontal axis from zero to eight degrees, relative to the axis of the grinding wheel spindle. Moreover, the speed of the regulating wheel, (which can be changed by means of a gear box) and the diameter of the regulating wheel also influence

the feeding rate of the work. The interdependence of these factors is closely approximated by the following mathematical expressions—

$$F = \pi d N \sin \alpha$$

Where  $F$  = feed of the work, in inches per minute

$d$  = diameter of the regulating wheel, in inches

$N$  = speed of the regulating wheel, in revolutions per minute

$\alpha$  = angle of the inclination of the regulating wheel.

Figure 6 shows diagrammatically these conditions when viewing the arrangement at a right angle to the axis of the grinding wheel spindle. The theoretical feed is based on the assumption that there is no slippage of the work whatsoever in its contact with the regulating wheel. In actual practice the error in this connection rarely exceeds two per cent. It is often necessary to pass work between the wheels more than once. The number of passes is determined by the amount of stock to be removed, the condition of the work as to roundness and straightness, the quality of the material, and the limits of accuracy required.

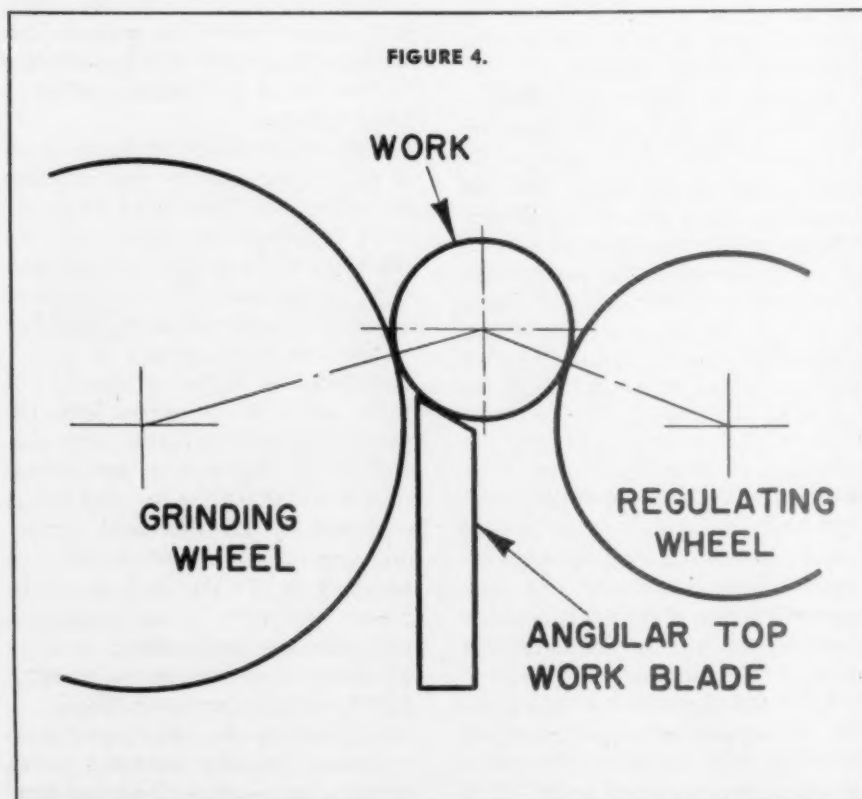
With this method there is a fixed relation between the grinding wheel, regulating wheel, and the work supporting blade. The wheels are adjusted so that the distance between their active surfaces, together with the height of the work blade, determines the diameter of the ground piece. The centers of the wheels are stationary during grinding operations and the regulating wheels requires slight readjustment from time to time to compensate for the wear of the grinding wheel.

A work rest or fixture, which provides means for holding the blade, incorporates adjustable guides, both to the front and rear of the wheels. These guides must be accurately aligned with the regulating wheel face to insure the work traveling in a straight line.

#### In-Feed

In-feed method is usually employed when grinding work which has a shoulder, head or some portion larger than the ground diameter. The same method is used for the simultaneous grinding of several diameters of the work as well as for finishing pieces with taper, spherical, or any other irregular profile.

In general, this method corresponds to the plunge cut or form grinding on



**FIGURE 4.**

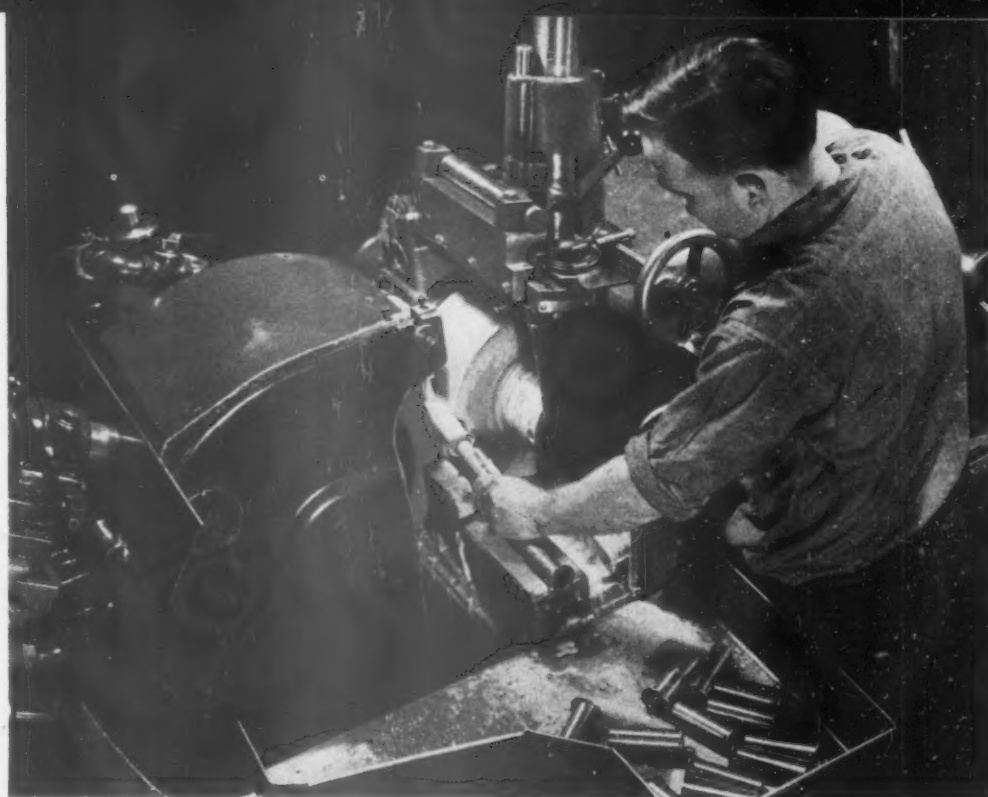
the center type grinder.

The length of the section or sections to be ground in any one operation is limited by the width of the grinding wheel. As there is no relative or axial movement of the work, the regulating wheel is set with its axis approximately parallel to that of the grinding wheel. Only a slight angle is maintained to keep the work tight against an end stop.

#### Relation of factors

With the in-feed method, there is a fixed relation between the work support blade and the regulating wheel. These two units clamped together carry the work to and from the grinding wheel. This movement is performed by turning the in-feed lever 90 degrees. As the lever is brought down, the work with the regulating wheel is advanced to the grinding wheel, the desired size being secured when the lever has made its full swing. On reverse movement of this lever, the gap between the wheels is increased, and either a manually or automatically operated ejector kicks the work out from between the wheels, and another piece is placed in position by the operator.

If the part to be ground is longer than the width of the wheels and must be ground only a short distance from each end, a variation of in-feed grinding is used, which is called the out-board roller support method. One end of the work is supported by the blade between the wheels and the other end



THE in-feed method of centerless grinding is usually employed when work has a shoulder or head, or other portion, larger than the ground diameter.

rests on rollers which are usually outside of the machine, but form part of the fixture which is called the in-feed roller work rest.

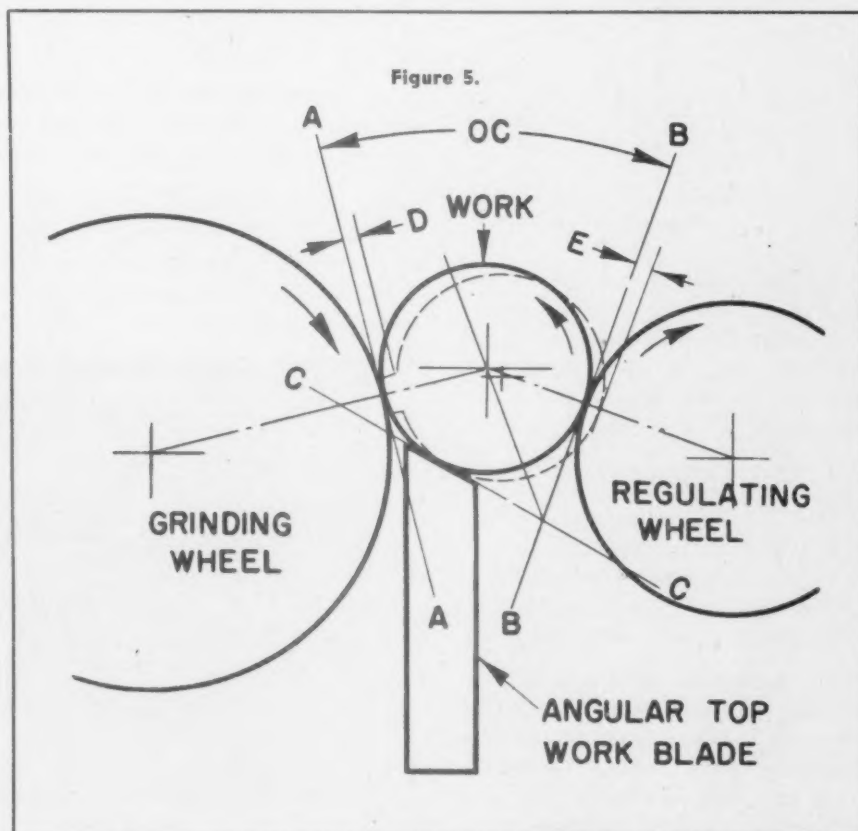
The same cycle of operation as described for in-feed grinding is used, the only exception being that it is not

always possible to use the ejector, because of the size of the work, which is usually larger than that of the standard in-feed class. There are many other advantages of the in-feed method, but they need not be discussed here.

#### Coming Soon-- A Feature on Tool Grinding

Important to metal conservation is proper grinding of tools. Both scarce tool steels and metals for fabrication can be saved, or put to their most efficient use, through correct tool sharpening and maintenance.

Tooth rests used in sharpening cutters, grinding deep-hole drills and wheel specifications for various types of tool steels will be included in this feature.



## Advantages

In general, all centerless machines offer the following principal advantages:

1. The work is rigidly supported directly under the grinding cut as well as the full length of the cut. No deflection takes place during the grinding operation, thus allowing, if necessary, a heavier cut to be taken.
2. No axial thrust is imposed on the work while grinding. This absence of end pressure makes possible grinding of long brittle pieces and easily distorted parts.
3. As a true floating condition exists during the grinding process and the error of centering is eliminated, less grinding stock is required, with correspondingly longer wheel life.

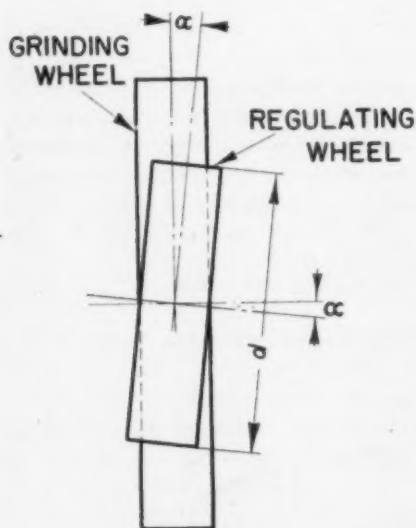
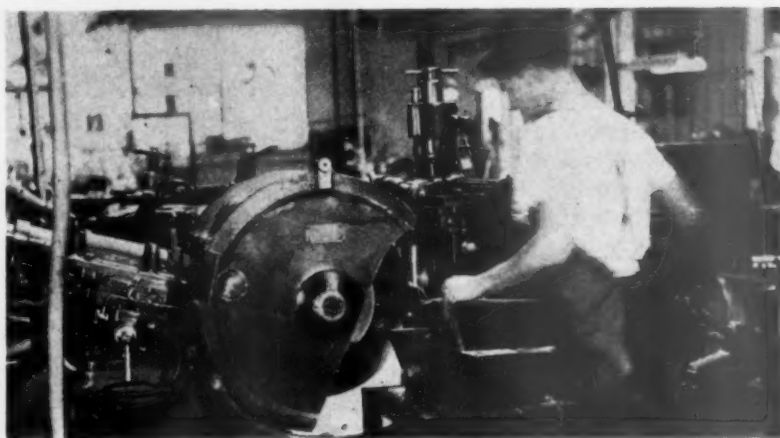


Figure 6.

4. The possibility of error in setting up the job and in readjusting to compensate for wheel wear is reduced by half, because stock removal is measured on the diameter and not on the radius.
5. Error due to wheel wear is likewise reduced.
6. There are but few wearing surfaces, and the lubrication of the spindles is automatic; therefore, the machine requires only slight attention.
7. Regardless of the employed method, the grinding of the smaller size work can be assisted by use of a magazine, gravity chute, or hopper feeds, provided the shape of the piece will permit the use of such devices.



Photos courtesy of the Macklin Company

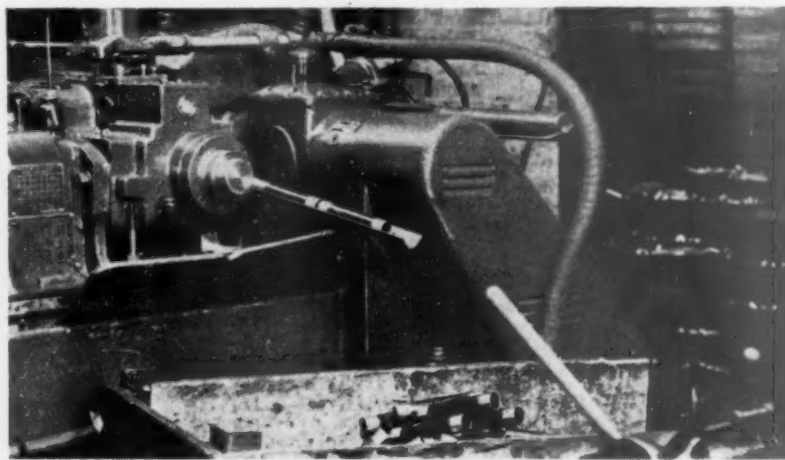
## CENTERLESS GRINDING TANK BODY TUBING

IMPORTANT to every grinding job are wheel specifications. Generally the grinding wheel manufacturer is well equipped to set-up specifications, or to improve the work and production efficiency on a given job. An example of an improved set-up is furnished in the facts concerning a change in wheel specifications for centerless grinding seamless and welded tubing used in tank track bodies.

Tubes, 15/8-inches diameter by 85/8-inches long (seamless showed a Rockwell "B" rating of 102 to 104, welded showed about 82) were originally ground one end at a time, using a 20 by 4 by 12 grinding wheel and a 12 by 4 by 5 (csk 7 1/2 by 1/2 by 1/2) regulating wheel. Now, both ends are ground simultaneously using two 20 by 13/8 by 12 grinding wheels, with a spacer between them, with only one regulating wheel, 12 by 85/8 by 5 (csk 8 by 3).

Tubes are ground 13/8-inches back from each end. A good commercial finish is required on these tubes due to the fact that they must be a pressed fit into a forging, prior to brazing.

Using two wheels, an important factor is to keep them both uniform as to grade, thickness and diameter. If this is not done, one grinding wheel will tend to break down more rapidly, causing one end of the tube to be oversize. Limits are plus or minus .0005-inch.







# Tool Engineering DATA SHEET

## SPECIFICATIONS AND ANALYSES

The specifications and analysis contained in this Data Sheet are by courtesy of the Lebanon Steel Foundry, Lebanon, Penn. They are designed to guide the user to a desired or specified quality, or, to an acceptable alternative. For example, a combination of strength and resistance to corrosion

may be desired, yet one may be a prime consideration and the other a secondary factor. Again, both of these qualities may be sacrificed to hardness. The point is to obtain the nearest approach to the ideal with the materials now available. This data should provide that choice.

### COMPARABLE DESIGNATIONS OF CORROSION RESISTANT ALLOYS

Chart includes comparable designations of A. C. I. (Alloy Casting Institute), A. I. S. I. (American Iron and Steel Institute), A. S. T. M. (American Society for Testing Materials), Hydraulic Institute, SAE (Society of Automotive Engineers) and U. S. Navy.

A. C. I.* Standard Designation	A. I. S. I. Type No.	A. S. T. M. Designation	Other Designations	Principal Alloying Elements					Typical Physical Properties			Heat** Treat
				Cr.	Ni.	C.	Mo.	Other Elements	Tensile Strength	Yield Point	B. H. N.	
	501	A157 Grade C8A		4.5—6.5		0.15—0.30	0.40—0.50	Va.	110,000	80,000	215	#1
CB-30	442		Hydraulic Institute Type No. 1	18.0—20.0	2.0 Max.	0.30 Max.			100,000	75,000	200	#1
CA-14	403 410	A157 Grade C8	SAE No. 51210 Hydraulic Institute Type No. 0	12.0—14.0	1.0 Max.	0.14 Max.			85,000	55,000	170	#1
CA-40	420F		SAE No. 51335	12.0—14.0		0.20—0.30		Ni. Mo.	200,000	150,000	500	#2
	442		Carpenter No. 3	20.5—22.5		0.20—0.30		Cu.	95,000	68,000	195	#1
CC-35	446		Hydraulic Institute Type No. 2	27.0—30.0	3.0 Max.	0.35 Max.			60,000	35,000	170	#3
CF-7C	349	A157 Grade C9	U. S. Navy 46S27a Grade No. 1 Weld SAE No. 30705 Hydraulic Institute Type No. 3	18.0—21.0	8.0—10.0	0.07 Max.		Cb.	70,000	32,000	150	#4
CF-7	304	A157 Grade C9	KA2S Hydraulic Institute Type No. 3 U. S. Navy 46S27a Grade No. 1 SAE No. 30905	18.0—21.0	8.0—10.0	0.07 Max.			70,000	32,000	150	#4
CF-7-SE		A157 Grade C9	U. S. Navy 46S27a Grade No. 7	18.0—21.0	8.0—10.0	0.07 Max.	1.50—2.00	Se.	70,000	32,000	150	#4
CF-7M	317	A157 Grade C9	KA2SMo. SAE No. 30805 Hydraulic Institute Type No. 4	18.0—21.0	9.0—11.0	0.07 Max.	2.75—3.25		72,000	35,000	160	#4
CF-20	302	A157 Grade C9	KA2 SAE No. 30915	18.0—21.0	8.0—10.0	0.20 Max.			72,500	32,500	160	#4
CF-20SE	303	A157 Grade C9	SAE No. 30615 Type 2	18.0—21.0	8.0—10.0	0.20 Max.		Se.	72,500	32,500	160	#4
CF-20M		A157 Grade C9	KA2Mo.	18.0—21.0	9.0—11.0	0.20 Max.	2.75—3.25		72,500	32,500	170	#4
CM-25	325	A157 Grade C10		9.0—11.0	19.0—21.0	0.25 Max.			65,000	30,000	125	#4
CG-20				21.0—23.0	9.0—11.0	0.20 Max.			72,000	35,000	160	#4
CH-20	309			24.0—26.0	9.0—11.0	0.20 Max.			80,000	40,000	160	#4
CH-10C				24.0—26.0	10.0—12.0	0.10 Max.		Cb.	80,000	40,000	160	#4
CH-20M				24.0—26.0	9.0—11.0	0.20 Max.	2.50—3.50		85,000	45,000	170	#4
CE-30	312			27.0—29.0	10.0—12.0	0.30 Max.			83,000	47,000	165	#4
				15.0—17.0	34.0—36.0	0.07 Max.	3.25—3.75	Cu.	70,000	35,000	150	#4
			Worthite Hydraulic Institute Type No. 5	18.0—20.0	22.0—25.0	0.07 Max.	2.50—3.00	Cu.	65,000	32,000	140	#4
			duPont No. 1364 (FA-20) Hydraulic Institute Type No. 5	19.0—21.0	28.0—30.0	0.07 Max.	3.25—3.75	Cu.	65,000	32,000	140	#4

\*The A. C. I. (Alloy Casting Institute) is a group of the major alloy manufacturers conducting research work at Battelle Memorial Institute. A. C. I. designations with the initial letter "C" indicate alloys generally used to resist corrosive attack at temperatures less than 1200° F.

Note: The A. I. S. I. type numbers and SAE specifications cover wrought steel products.

The A. S. T. M. designations are for cast stainless steel.

\*\*Heat Treatments: #1—Normalize and draw,

#2—Oil quench and draw or Air quench and draw,

#3—As required, #4—Water quench 2000° F.

# Tool Engineering DATA SHEET

## COMPARABLE CLASSIFICATIONS WITH NOMINAL ANALYSIS OF REGULAR CARBON STEELS, STRUCTURAL ALLOY STEELS, AND STAINLESS ALLOYS

Government Specifications	S.A.E. Anal. Specif.	A. S. T. M. Specifications	NOMINAL ANALYSIS								Typical Physicals **		Typical Brinell Hard.	Heat* Treat.
			C.	Si.	Mn.	Cr.	Ni.	Mo.	Va.		Ultimate Strength	Yield Point		
QQ-S-681a Class 0	1030	A-27-39 GR-A-2	.30	.40	.75						70,000	40,000	140	#1
Class 1	1020	A-215-39T GR-A-2-W	.20	.40	.70						65,000	35,000	140	#1
Class 2	1025	A-27-39 GR-B	.25	.40	.70						70,000	40,000	140	#1
Class 3	X1030	A-148-36 CL-B GR-2	.30	.40	1.40				.11		90,000	55,000	160	#1
Class 4	X4130	A-148-36 CL-B GR-3	.30	.40	1.40	.75		.30			100,000	70,000	190	#1
Class 4	4140	CL-C GR-2									110,000	85,000	228	#2
		A-148-36 CL-C GR-3	.40	.40	.75	1.10		.30			125,000	95,000	250	#2
											150,000	120,000	300	#2
Navy Dept. 4951J&K Class B	1020	A-215-39T GR-A-2-W	.20	.40	.70						65,000	35,000	140	#1
Class D	1025	A-27-39 GR-B	.25	.40	.70						70,000	40,000	140	#1
Class A	X1030	A-148-36 CL-B GR-2	.30	.40	1.40				.11		90,000	55,000	160	#1
Class F	X1030	A-148-36 CL-B GR-2	.30	.40	1.40				.11		90,000	55,000	160	#1
Class C	1025	A-27-39 GR-N-2	.25	.40	.70						65,000	35,000	140	#1
Navy Dept. 46533		A157-40 GR-C1	.20	.40	.75			.45			75,000	42,000	150	#1
Navy Dept. 46527a Grade 1	30905	A157-40	.07	1.00	.75	19.0	9.0				70,000	30,000	150	#3
Grade 1 Weld	30705	CSa	.07	1.00	.75	19.0	9.0			CB. 70	70,000	30,000	150	
Grade 7	30615		.07	1.00	.75	19.0	9.0			SE. 20	70,000	30,000	150	
R1XS192	X2030		.32	.40	1.10		.75				110,000	85,000	240	#2

Ordnance Dept.

U. S. Army

AXS492

AXS493

Cast Steel Armor: Composition, Heat Treatment, and Physical Properties are confidential, and will be reported only to proper authorities.

All Government specifications are for cast steel.

The Society of Automotive Engineers (S. A. E.) specifications cover rolled steel, but are the approximate corresponding chemical analyses.

The American Society for Testing Materials (A. S. T. M.) specifications are all cast steel specifications.

\*\*Physical properties as shown are equal to or greater than specification requirements.

\*Heat Treatments:

#1—Normalize and draw.

#2—Oil quench and draw.

#3—Water quench 2000° F.

► A POINT to be stressed, especially at a time when alloying materials are at a premium and vital to the war effort, is the matter of design. Carefully considered design is the best substitute for weight, which alone does not imply strength in materials. Consider, for example, structural shapes as compared to solid bars. Or, the properly proportioned tube, which provides four fifths of the strength of a solid shaft with only a portion of its weight. Or, the ribbed casting, further lightened by coring or open holes, yet capable of meeting all requirements of strength and rigidity. In designing cast shapes, the designing engineer should consider such factors as stresses and applications of load.

► A SHAPE under tension would vary from one under compression, the one may be ruptured, the other crushed or distorted. Especially is it desirable that sections be uniform, with a bias toward lightness in the direction that the cast metal would naturally flow. Such forethought provides against shrinkage cracks when cooling. The properties of cast metals may be further enhanced by normalizing and heat treating, as outlined in the above data. This is an important consideration in shapes or structures subject to recurrent shock or intermittent load, when fatigue may result in crystallization and eventual failure. Design for lightness, but so that all possible conditions may be provided for.

NOTE: On this and the preceding page is the eleventh of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.



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SEN

# Handling Welded Assemblies

## A RESUME OF WELDING TECHNIQUES

A. E. RYLANDER  
INDUSTRIAL ENGINEER

THE techniques and methods of arc welding have been generally discussed in previous issues, and they are important enough, as are the tools and appliances used. But, unless handling, especially of bulky assemblies, is also included in the general scheme, the best laid plans of Welding and Tool Engineers are likely to "gang alee". This concluding article, then, will include suggestions for handling of bulky assemblies along with a resume of the tools and equipment used.

Handling, of large assemblies, implies not only the moving or conveying of units in process from one station or fixture to another, as through the various stages and operations, but may imply the conveying of the operators.

For example, an assembly may be made to move on a conveyor, with the operator working from a fixed area, or, the work may be of such proportions that it will affect a greater economy to have the operator work from a travelling carriage. In such case, one naturally infers a self contained unit; i.e., a transformer mounted directly on the carriage. Otherwise his range of operations will be comparatively limited. Such a set-up is shown in Figure 1, the assumption

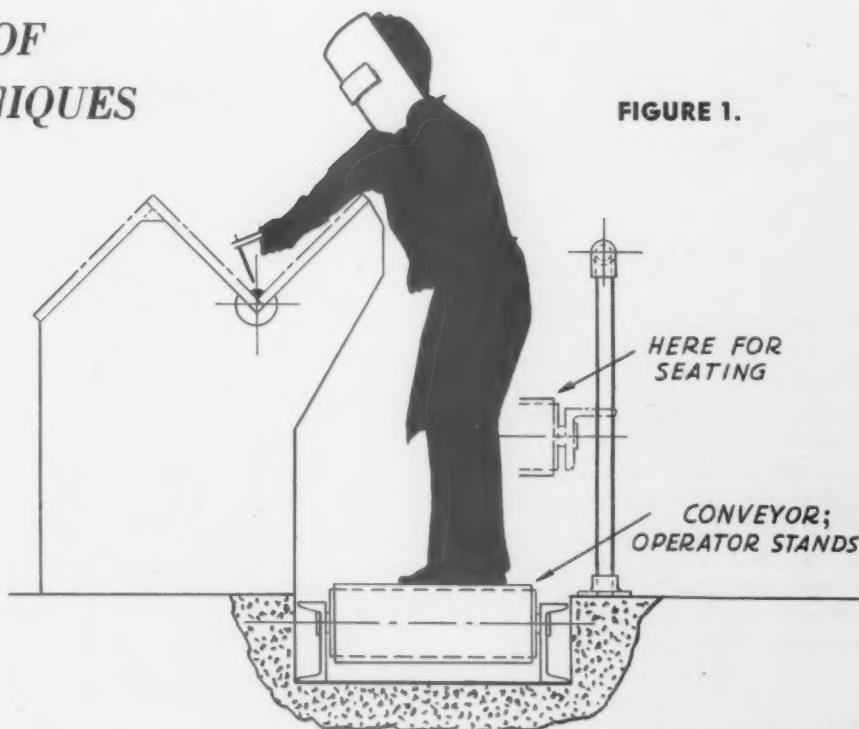


FIGURE 1.

being that the irregular contour of the welded joint is such as to preclude economical automatic welding.

Again, an assembly may be of such proportions, and may entail such elevation from the floor, that mechanical or hydraulic elevators may be required. These, of course, should be controlled from the operator's platform, to insure the most convenient working position as the welding progresses in ascending or descending direction. In Figure 2 we have a more involved, travelling elevator; not only does it run on tracks, providing considerable range, but a narrow trench between the rails provides clearance for the cylinder of the hydraulic ram. In this connection, simple trackage can be laid with channel iron (shown) which obviates the heavier rails and incidental flanged wheels.

As a practical substitute for hydraulic lifts, tiering trucks or stackers may be used. No doubt there are many concerns, now converted to war production, that have one or more of these otherwise handy units on hand and which may be idle due to conversion from pre-war production. They can be used to advantage in

many cases; in fact, it is good engineering—not to say management—to use existing equipment to the utmost provided that it does not hamper production.

Again, the resourceful engineer may resort to a coxswain's chair, too obvious to illustrate. This implies no hardship or discomfort to the operator, who may raise or lower his chair by means of a light electric hoist. Transverse trolleys will "position" him to or from the work. Naturally, the engineer with a specific problem on his hand will have to use the methods best suited to the job.

### Use of Conveyors

Let us, now, take a slant at conveyors as an alternative to moving by cranes. We will assume a box section, the "tailboard" of which is to be welded inside and outside on both sides, as in Figure 3. The simple, and at first thought logical method is to lay the assembly on one side, as in Figure 4, preferably on skids of convenient height. Then, either the top or bottom side plates are welded to the tailboard, or both simultaneously if a shield is provided so that the

● All work units and assemblies shown in this article, as well as welding heads and mechanical appliances, are non-descript. Fixtures, conveyors, and so forth, are schematic, the whole designed to convey ideas rather than to bear on specific applications.

THE EDITORS.

● *Driving dogs, for conveyors used in arc welding, should be shoved so that weld is applied between rollers or pallets. As far as possible, protect bearing surfaces and moving parts from shatter.*

lower operator is not endangered by splash from the welder overhead. Between each bead, there is implied a chipping or cleaning operation, during which the welders are idle unless another unit is in process close by. Hence, there is alternate welding and chipping until the joint is completed, when the unit is turned over (we're assuming a crane now) and the opposite side is similarly processed. Then, the unit completed, it is picked up by crane and moved to another station, sometimes a hazardous procedure if it is to be moved over other workmen.

### Roller Conveyor

A preferable method is shown by Figures 5, 6 and 6A. The first is a cross-section of a standard roller conveyor, split for the passage of a pusher. This, incidentally, is merely a dog on a standard conveyor chain of the required strength. Note that the conveyor is lightly tilted, with the top edge of the travelling unit bearing against a series of rollers mounted on a rail. This is for safety, which could also be insured if rollers were installed both sides of the unit. Either way will work, but the advantage of the tilt is that only one rail is required and there is greater accessibility for the top welder.

The conveyor moves at a speed which will enable the welder to lay a bead within a few feet of space. Say that the joint is 30" long, and that welding is at the rate of 3 inches per minute, for easy figuring. Then, the time required for one bead is 10 minutes. If the welder can work within a range of 20 feet—i.e., 10 feet either side of the transformer—a conveyor speed of 2 feet per minute would be practical. With the conveyor still moving, the chipper now comes into the picture, and we'll allow 5 minutes or 10 feet of travel for his operation.

(Continued on page 103)

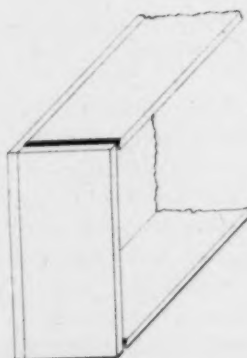
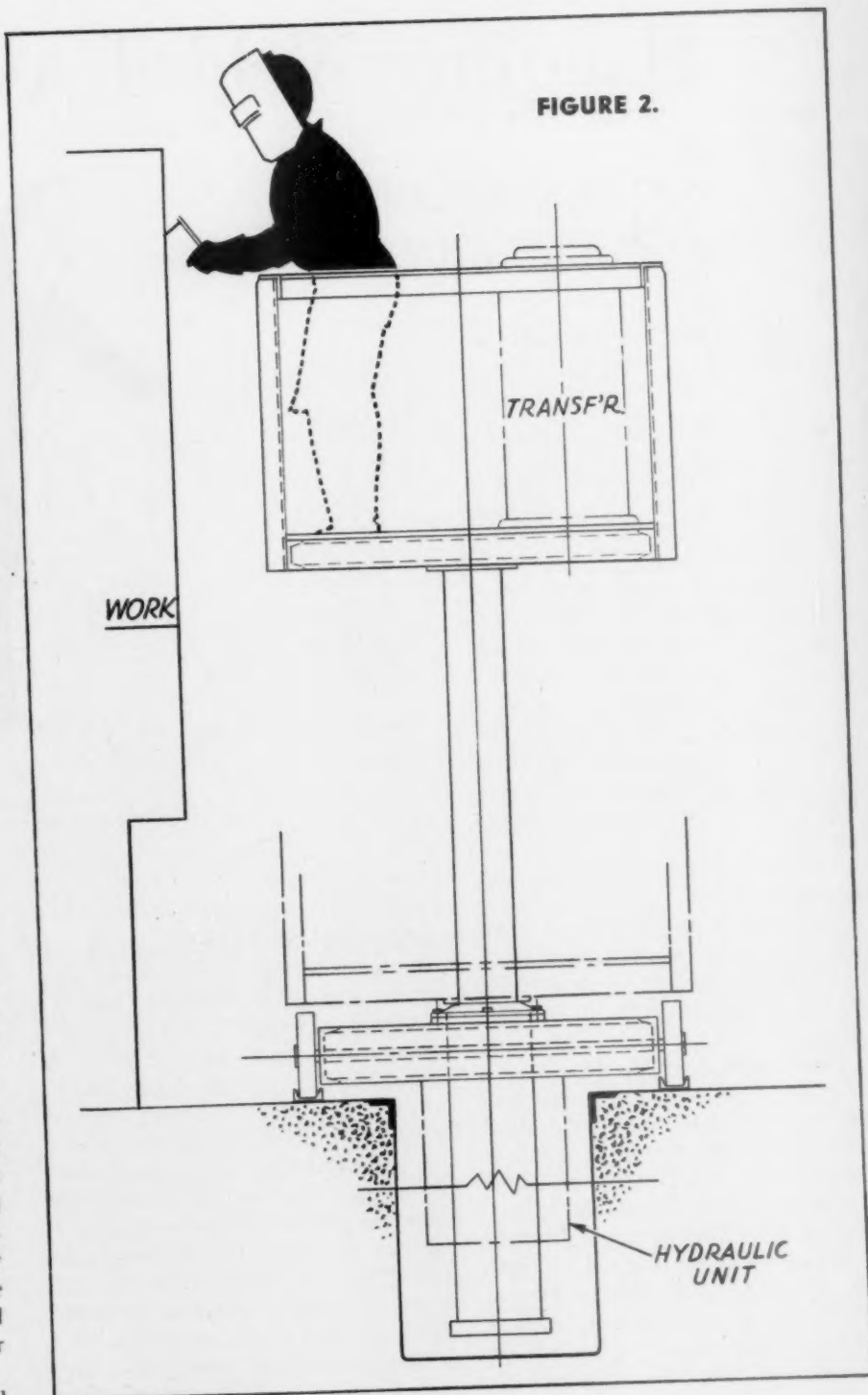
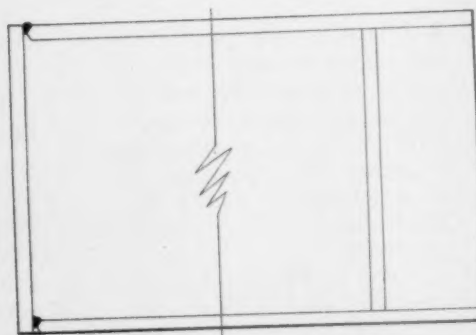


FIGURE 3 (left)

FIGURE 4 (right)







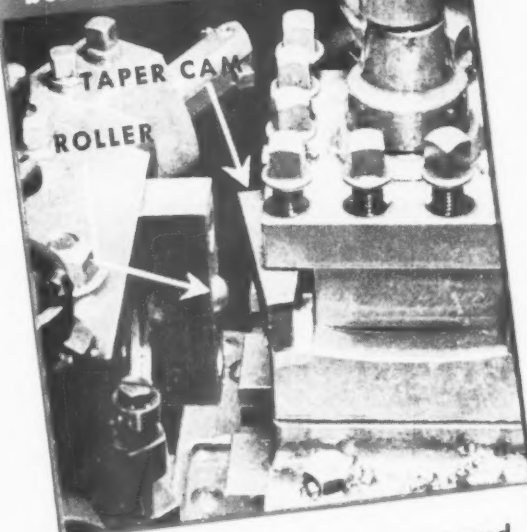
# A Citation for Men in War Industry



↑  
Fellow workers admire the Victory Pin awarded to operator Nichols.

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Claude L. Nichols, turret lathe operator for WILCOX-RICH CO., Saginaw, avoided holding up an important job by a practical tooling setup to produce the piece which otherwise would have required a turret lathe with compound cross slide.

The photograph at the left shows how he used a taper cam on the cross slide and a roller in a turret station to guide the cutter for an accurate steep taper and smooth finish. The cutter is also ready for facing off and turning O. D.

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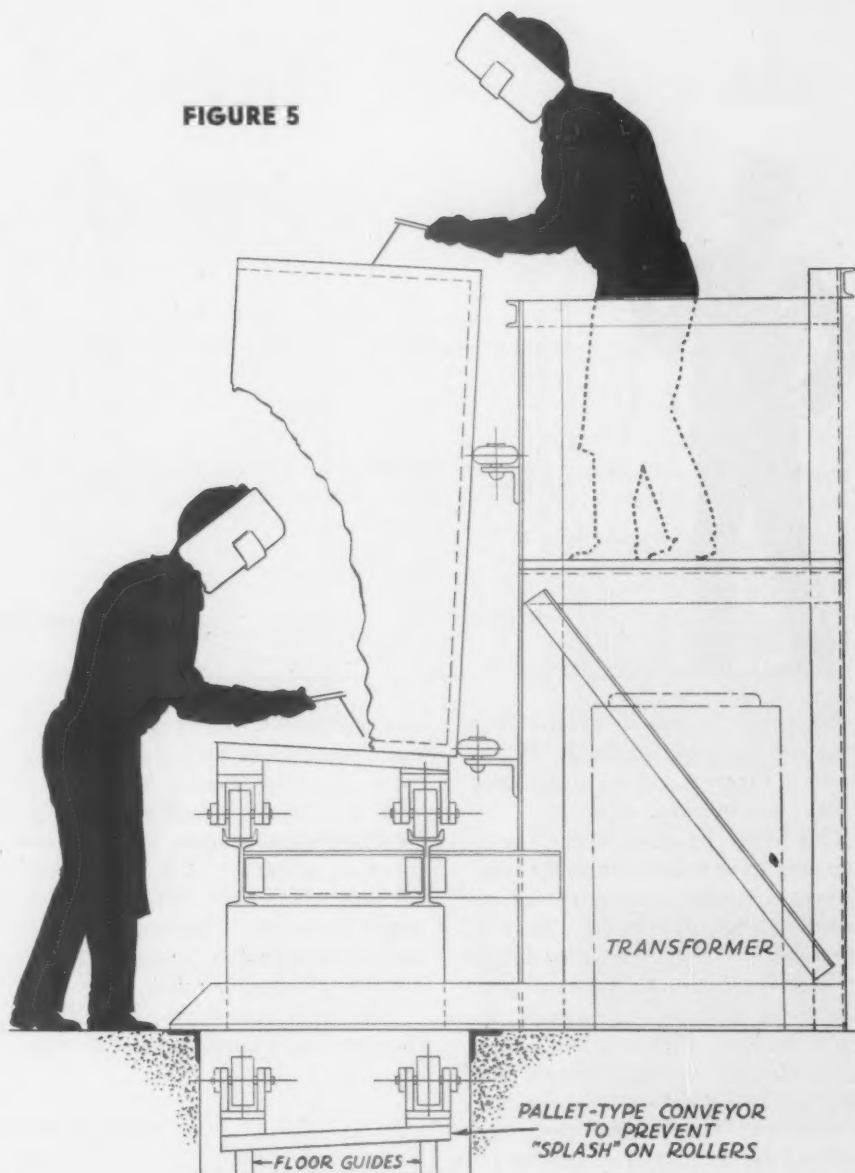
**PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK  
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● Hydraulic or air cylinders, used for advance and recession of welding heads, should be adequately cushioned to reduce shock on delicate mechanisms. In addition to cylinder cushions, rubber or spring bumpers are recommended. Fluid or air should be metered for comparatively slow motion.

(In this connection, a unique rotary wire brush has been recently marketed which may obviate chipping entirely). By this reckoning, the laying of one bead, with incidental chipping, will require 30 feet of conveyor; if five beads are to be laid, the conveyor length will be 150 feet.

However, we have welded only one side, or rather, one side of each joint, the lower one on the inside, the upper on the outside. It is therefore necessary to reverse the structure, when the opposite sides may be welded. The reversal is accomplished with a comparatively simple "turnover", which may be a converted standard positioner. The method is schematically outlined in Figure 6A a general floor layout in Figure 6.

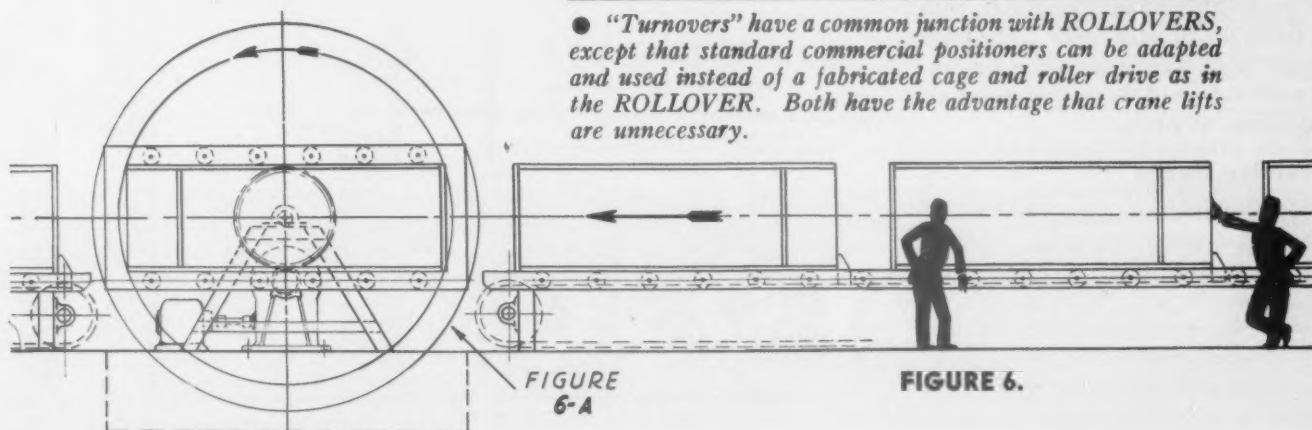
What we have actually accomplished by the use of the conveyor is this: That the whole operation is performed in a space limit (of width) not greatly exceeding the width of the unit itself, and while considerable length is required (it can be doubled back) the whole is progressing and greatly reduces total operator time. Furthermore, there is no lifting by crane, which promotes safety, and plant layout can be so arranged that



the unit passes easily into the next stage of operation.

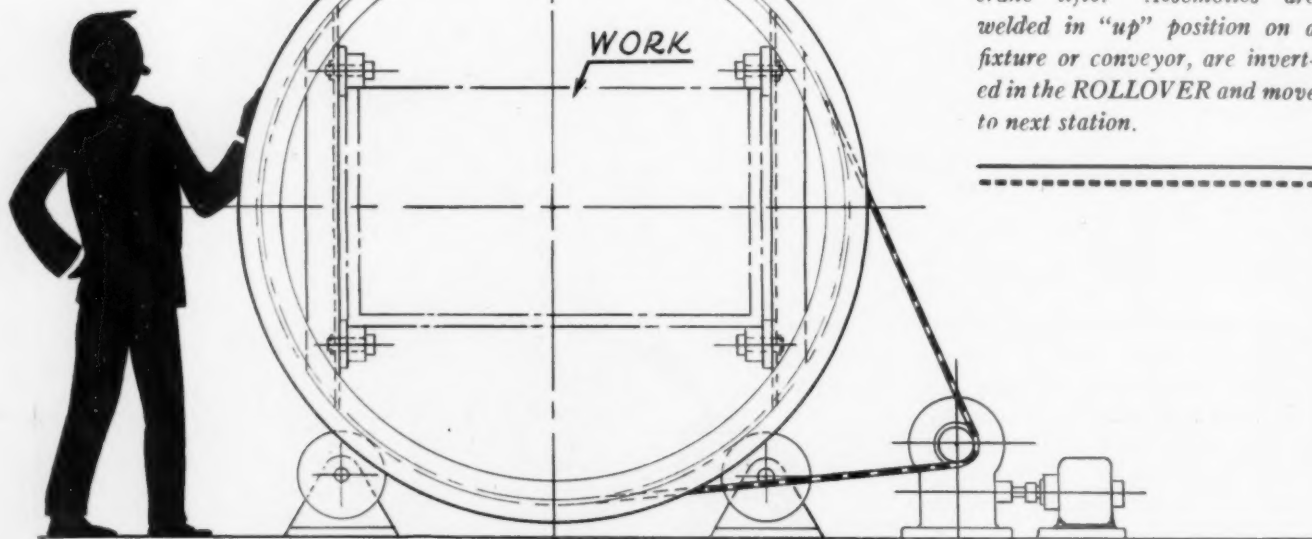
One can compare the set-up to the manufacture of welded axle housings, or automobile frames; certainly the processing of these well known as-

semblies is expedited by the use of conveyors. Why not, then, heavier assemblies essential to war production? We need speed-up here, too. If, now, the question comes up regarding an operator having to walk



● "Turnovers" have a common junction with ROLLOVERS, except that standard commercial positioners can be adapted and used instead of a fabricated cage and roller drive as in the ROLLOVER. Both have the advantage that crane lifts are unnecessary.

**FIGURE 7**



● "Rollovers" imply progressive advance of work without crane lifts. Assemblies are welded in "up" position on a fixture or conveyor, are inverted in the ROLLOVER and move to next station.

as he welds, he can be seated on a conveyor somewhat similar to the one shown in Figure 1, geared to the speed of the line conveyor.

There may be cases where assemblies may have to be recurrently turned over, or where turnovers are required between operations. Here, a "roll-over" of the type used for dumping railroad cars may be employed, although a more or less specific design is shown in Figure 7. Note that, as shown, the assembly enters and leaves at the same level—i.e., the cage is "centered"—but it can enter at one level and be discharged at another by simply throwing off center. What the author is doing here is to convey ideas applicable to diverse jobs rather than to some one specific set-up. In this war production, we need ideas that may be widely applied. However, the object is to show that bulky assemblies may be progressively processed on conveyors with a minimum of crane lifting and, as a result, with a minimum of floor space. The main object is to speed production by taking advantage of the best of materials handling equipment.

#### Welding Heads

It may not be amiss, here, to expand a bit on welding heads, especially as regards their advance and recession from the arc. To be specific, an automatic welding head must be clear of the work when the latter is being loaded or positioned, else there might result irreparable damage to expen-

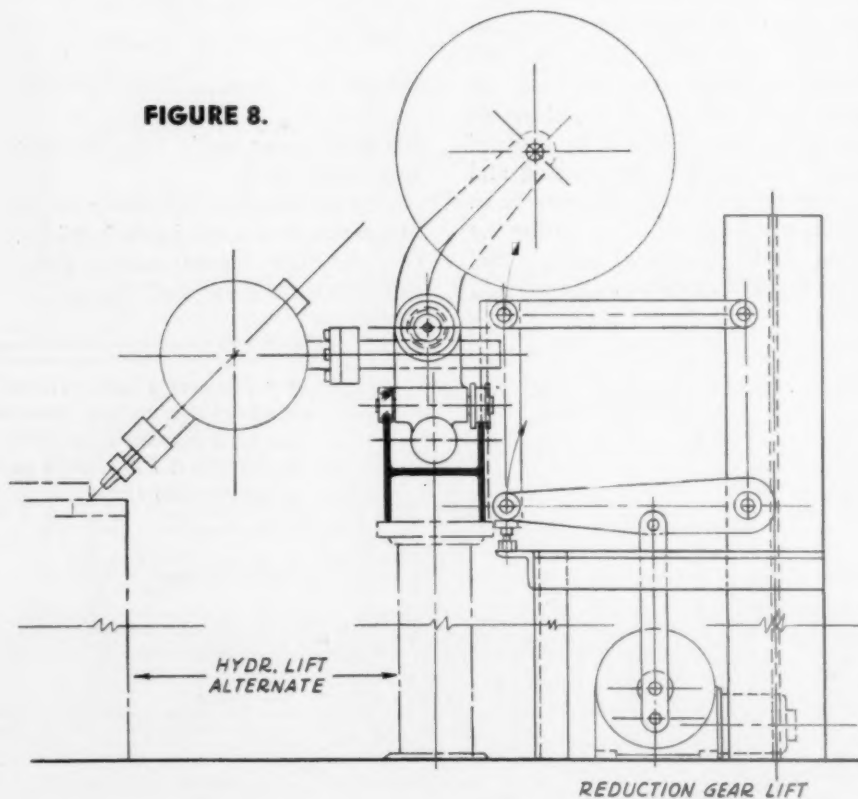
sive equipment. There are only three basic methods of effecting such clearance:—(a) by moving the work in and out; (b) by swinging arm or (c) by straight line motion, either up and down or sideways, or a combination of both. To effect motion, one can resort to gearing, (preferably worm) with electric motive power, or to hydraulic cylinders or rams.

The applications are so manifold that one could illustrate ad infinitum,

but the schemes shown in Figures 8, 9 and 10 will suffice for general study. Figures 8 and 9 are largely similar; the one shows a "swing" recession by means of a commercial reduction gear, the other by means of hydraulic cylinders. If the latter, they must be cushioned to eliminate shock, especially during advance into welding position. Either should be provided with adjustable stops, and

(Continued on page 106)

**FIGURE 8.**



THE TOOL ENGINEER

# 5 Ways to Get Faster Deliveries of Special Carboloy Tools and Blanks

A "special" Carboloy tool or blank is one made to special shape, size, tolerance or grade. Any one or all of these requirements—means a "special". It requires special handling apart from our regular production line of standards. To help you get essential specials with a minimum of delay and expense, we list below 5 suggestions to follow when ordering.

**BUT**—before you order—check your needs against Carboloy Standard Tools & Blanks. Produced and placed in stock by the thousands daily, Carboloy Standards are suitable "as is"—or adaptable by grinding—to 80% of all turning, boring, facing jobs. In this crucial period when every minute counts, you can usually save 6 to 8 weeks delivery by ordering standards instead of specials whenever possible.

## FIVE POINTS TO CHECK WHEN ORDERING "SPECIALS"

### 1. Follow these suggestions when specifying tolerances—

- Be sure your tolerances are as liberal as job will permit.
- Specify tolerances on all decimal dimensions.
- Use our standard tolerances whenever possible. These are:

#### STANDARD TOLERANCES

TOOLS			BLANKS	
Shank Width and Height	Finished Tools	Milled and Brazed Tools	Blank Dimensions	Tolerance
1" and less . . .	+ .000; - .010	+ .000; - .015	Up to $\frac{3}{8}$ " . . .	+ .015; - .000
Over 1" . . . .	+ .000; - .015	+ .000; - .015	$\frac{3}{8}$ " to 1" . . .	+ .020; - .000
Shank Length:			1" to 2" . . .	+ .040; - .000
4 $\frac{1}{2}$ " and less . . +	$\frac{1}{16}$ ; - $\frac{1}{16}$		2" to 3" . . .	+ .060; - .000
4 $\frac{5}{8}$ " to 7 $\frac{1}{2}$ " . . +	$\frac{1}{8}$ ; - $\frac{1}{8}$		3" to 4" . . .	+ .080; - .000
Over 7 $\frac{1}{2}$ " . . . +	$\frac{1}{4}$ ; - $\frac{1}{4}$		4" to 6" . . .	+ .100; - .000
			Over 6" . . .	+ .125; - .000

### 2. Specify the following stock sizes of shank steels:

$\frac{1}{4}$ " square	$\frac{5}{8}$ " square	$\frac{7}{8}$ " square	$\frac{5}{8}$ " x $1\frac{1}{4}$ "	1" x $1\frac{1}{2}$ "
$\frac{5}{16}$ " square	$\frac{1}{2}$ " x $\frac{3}{4}$ "	$\frac{5}{8}$ " x 1"	$\frac{3}{4}$ " x $1\frac{1}{2}$ "	$1\frac{1}{4}$ " x $1\frac{1}{2}$ "
$\frac{3}{8}$ " square	$\frac{3}{4}$ " square	$\frac{3}{4}$ " x 1"	1" x $1\frac{1}{4}$ "	$1\frac{1}{2}$ " square
$\frac{1}{2}$ " square	$\frac{1}{2}$ " x 1"	1" square	$1\frac{1}{4}$ " square	$1\frac{1}{2}$ " x 2"

- Design tools to use standard blanks. They are carried in stock.
- Use the same standard relief and rake angles that we use on our standard tools. Our manufacturing facilities are set up to produce these angles rapidly. (Send for catalog GT-142.)
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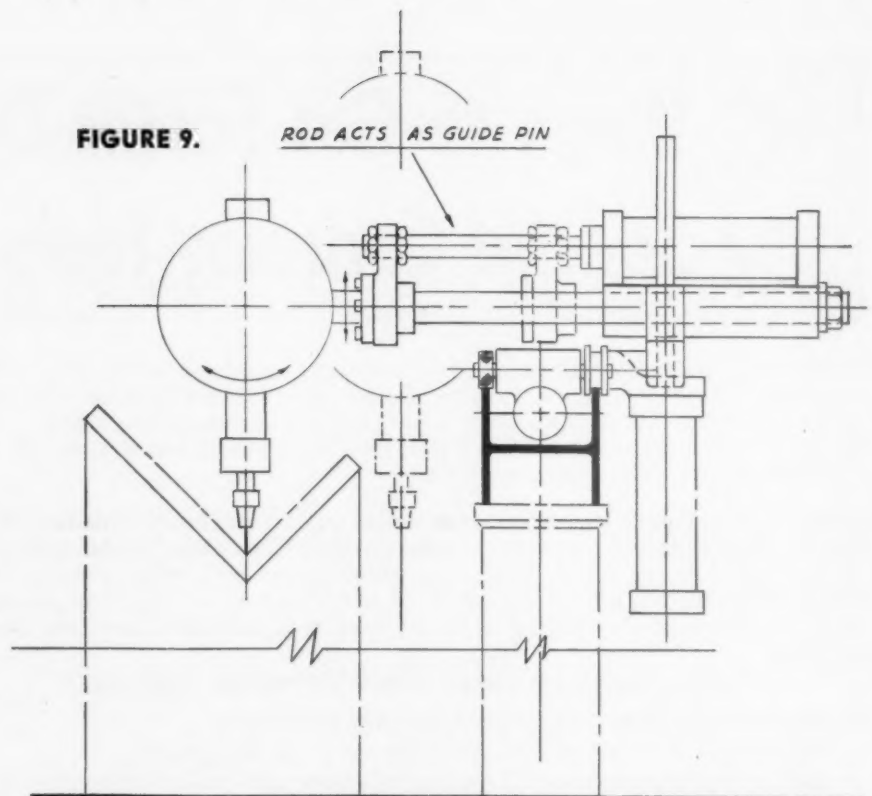
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both maintain the welding head in a vertical position during advance and retraction. Welding heads shown, incidentally are nondescript.

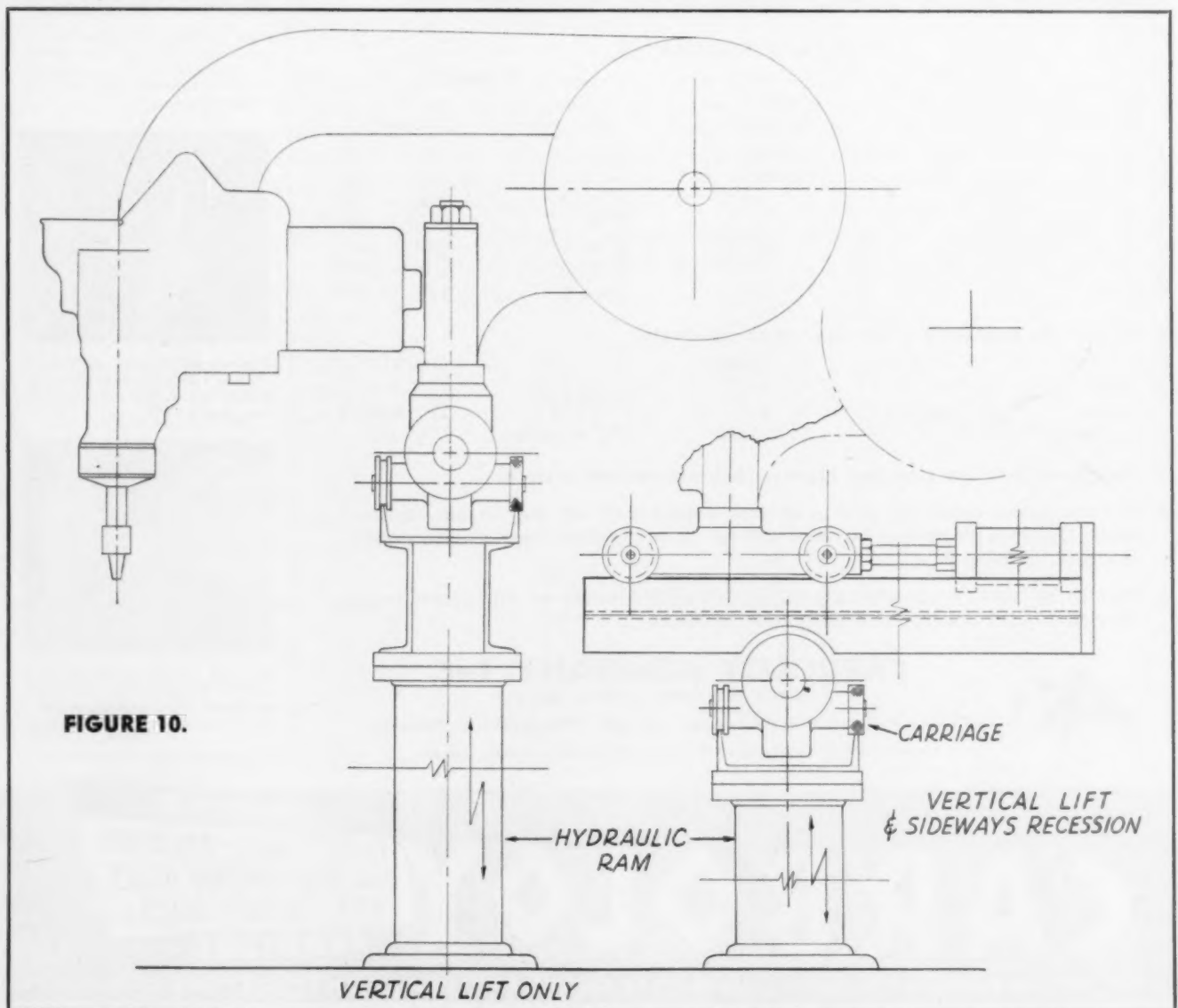
Figure 10 shows a commercial hydraulic lift (similar to type used for motor vehicle service) on which the guide rail is mounted, retractable in and out by means of auxiliary cylinders. But, as previously implied, the engineer in charge will just have to use his own judgment and, likely as not, the materials obtainable with which to work. There is the job, and there is the demanded output; do the one and meet the other. But, meet it more than half way, for before this war is over we are likely to find that the production schedule of today is altogether inadequate for tomorrow.

**CORRECTION:** August, 1942, p 74. Figure 6, Cullen-Friestedt. Figure 8, Ransome.

**FIGURE 9.**



**FIGURE 10.**



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•  
Triad Paint Stripping Compounds

•  
Triad Wet Spray Booth Compounds

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*Single Spindle*  
AUTOMATICS

## WORLD'S LARGEST DEEP-DRAW PRESS DEVELOPED AND BUILT BY CALIFORNIA MANUFACTURER

W. A. PRUETT

RESEARCH ENGINEER  
WEBER SHOWCASE AND FIXTURE COMPANY



To turn out large ventilators for liberty ships, two punches and dies of hand-ground cast mechanite iron are employed. These units total 13 tons in weight.

To turn out large ship cowl ventilators, the Weber Showcase and Fixture Co., Los Angeles, built the world's largest deep drawing press.



# Conversion for VICTORY

**T**HROUGHOUT the 44 years of our company's operations, we had been gathering experience in the manufacture of showcases, refrigerator equipment and similar goods. Then came Pearl Harbor, rapid expansions in all war branches and . . . literally overnight . . . calls for all sorts of weapons and goods to bolster our fighting fronts. Where such a firm as ours could fit into the war picture was not immediately apparent.

Today we know. Civilian goods of the type we produced are "out" for the duration. Many plants have converted. Some of our projects are confidential. The story of a major changeover, including the principal tools and our methods, should, however, interest other production men

facing similar problems.

From showcases, Weber Showcase and Fixture Company has turned to the primary task of fabricating more than 20,000 cowl ventilators for the hundreds of 10,000-ton Liberty ships being constructed in yards from Washington to Maine. It is our job to stamp, weld and finish those ventilators in eight sizes, and to do the job faster than ever has been accomplished before. The fact that Weber is building the majority of these ventilators for these cargo carriers is proof enough that we had to find a swift and sure method.

That method was achieved through the design and construction of a deep drawing press, believed to be the largest of its kind ever built. The

machine, weighing 250 tons, stands four stories tall, and embodies features never before incorporated in a die stamping press.

Die space, air cushion arrangement, stroke and power combine to make it an interesting machine and place it in the category of "biggest". The base alone weighs 25 tons; the top 9 tons. The structure is supported by 390 tons of concrete, and 6-ft. concrete walls surrounding the pit help dampen vibration and make the installation earthquake proof.

Normally, a press of this size would depend for its four corner posts upon forgings. Those forgings were not readily available in Los Angeles, nor could we be assured of delivery within the time allotted for construction.

This situation called for a speedy solution which we arrived at by the not-so-simple expedient of carrying along the engineering work and fabrication of parts simultaneously. H-column construction, with structural steel, eliminated the forgings.

This was, however, among the least of our problems. The deep drawing required turned our attention to other details. For example, we have allowed for 120 inches of daylight, a space necessary for the bolting on of large dies to the movable platen at the top, with a corresponding punch bolted to the lower platen, and adequate room for removal of the ventilator-half following the drawing process.

### Push Button Control

In operation, three rams force the top platen, which weighs  $21\frac{1}{2}$  tons, down with a total stroke of 84 inches, and at the end of the stroke the platen presses against a bed whose area totals 96 square feet. The three hydraulic pistons which push the top platen down operate under pressure of 2,000 pounds, creating a force of 1100 tons on the platen. These cylinders were made in two sizes. The center unit, cast steel with  $3\frac{1}{2}$ -inch walls, measures 26 inches, inside diameter, while the outer pair, of rolled steel, are 22 inches in diameter. Two hydraulic pumps supply power for the down stroke, and one operates the four  $8\frac{3}{8}$ -inch pullback cylinders with a total lift of 150 tons. From a bank of push buttons, the operator can vary the speed between two inches and five feet a minute on the downstroke. The pull back lifts the die 10 feet a minute.

While the procedure above described gives us a delicate yet powerful blanking operation, key to our success in such deep drawing lies in the arrangement of air cushions. As a general rule, air cushion pads supported by the lower platen of such a press are controlled by one main regulator valve.

In our press, the male die rests on a heavy steel bed and the drawing rings are supported by eight air cushions. Each of these can be regulated at pressures ranging from zero to 150 pounds. These eight cylinders, each of 18-inch diameter, provide a total holding pressure of 100 tons to the

lower ring to hold the draw rings together. By this means it becomes unnecessary, in drawing in the throat, to shim between the drawing rings, a procedure generally practiced.

### Wrinkling Eliminated

Now, suppose we are pressing a series of blanks. We find the early sheets wrinkling or tearing at one point. Perhaps a low pressure on the bed is indicated, permitting the sheet to flow too easily between the rings. We simply touch a valve which regulates the pressure in that area, and immediately hold the sheet from wrinkling. This procedure may be followed in any or all of the areas covered by the eight air cushions. Once adjusted, the pressures remain constant for a given batch of material.

Although several welding operations follow the first drawing of the halves, the new press simplifies fabrication of the ventilators enormously.

First, of course, the sheet is drawn. To my knowledge, this marks the first time when ventilators have been drawn on a press. In the past they have been formed by the well-known "Lobsterback" method, which involved considerable riveting, a process which results eventually in weakening of the structure due to rusting of the rivets. By our process, there is

By changing pressures at various points around the perimeter of the lower bed, stresses and strains may be so governed that the sheet being drawn will not crack and tear. Compressed air is delivered via control valves from these tanks beneath the press.

The men who conceived, engineered and built the press: left to right, Jack Gantz and W. A. Pruett, engineers; Fred and Karl Weber.

no riveting; and the welds remain as strong or stronger than the sheet itself through the life of the ventilator.

These funnels are made in two gauges, 16 and 14. Sixteen-gauge cold rolled steel, especially rolled to preserve its deep drawing qualities, is employed for five sizes of round funnels, from 10-inch to 24-inch, while 14-gauge steel is used in the 24-inch and 30-inch ovals and 36-inch round. Prior to being drawn, the blanks are cut to fit the size and shape to be drawn. For the moment at least, we have developed no formula by which the exact size and shape may be pre-determined. We develop the blank so that the metal may be drawn, leaving some flash around the edges.

The die starts down at one of the higher operating speeds, say five feet a minute, diminishing to two feet a minute until near the end of the thrust. When the male die contacts the metal sheet, it squeezes on downward under heavy pressure while the

(Continued on page 112)



# HARDINGE



HIGH SPEED  
PRECISION  
LATHE



HIGH SPEED  
PRECISION  
SECOND OPERATION  
MACHINE

PERFORMANCE HAS ESTABLISHED LEADERSHIP



HIGH SPEED  
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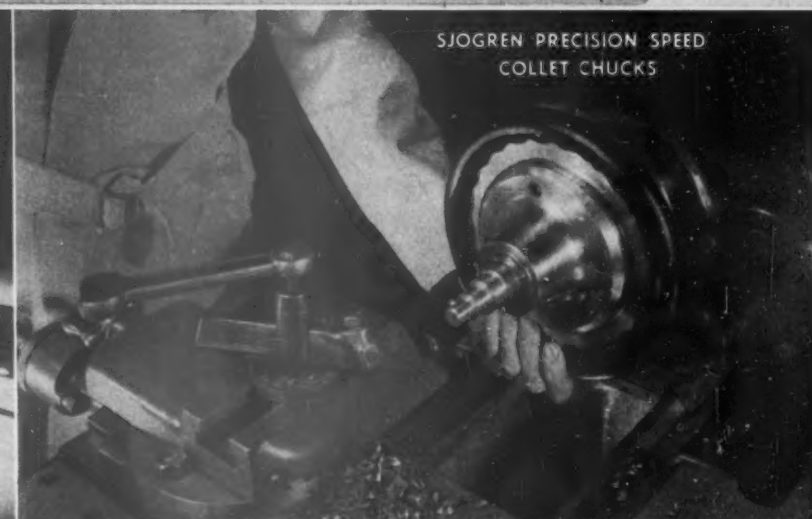


HIGH SPEED  
PRECISION  
TOOL-ROOM  
LATHE

FOR HARDINGE PRECISION EQUIPMENT



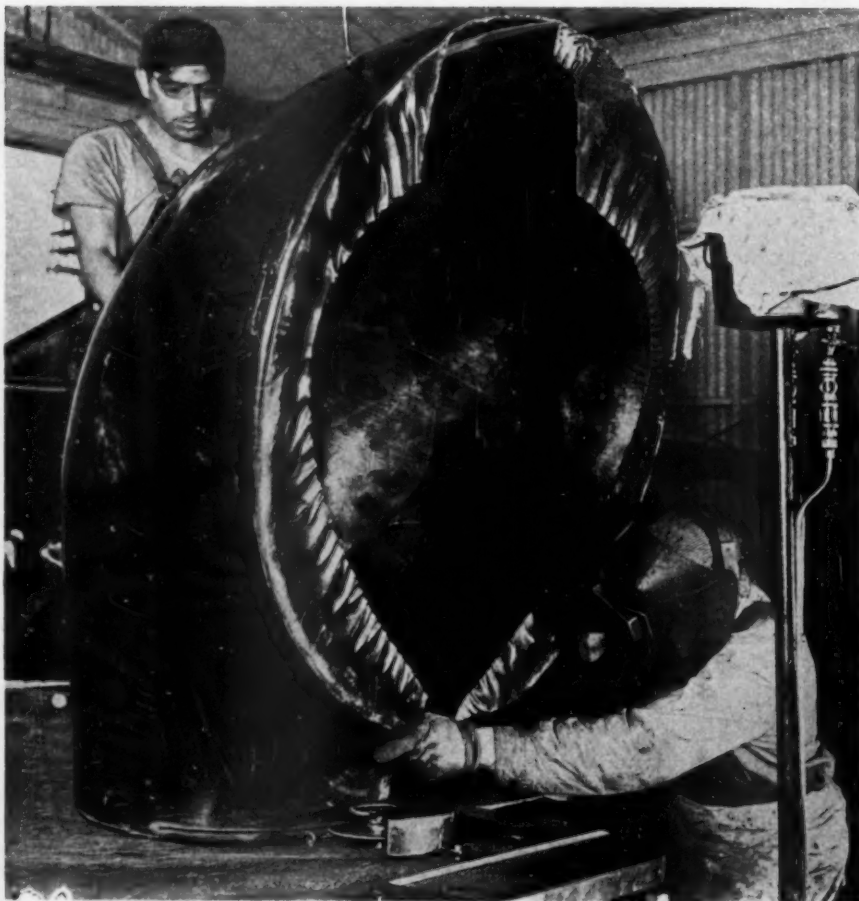
PRECISION COLLET  
INDEX FIXTURE



SJOGREN PRECISION SPEED  
COLLET CHUCKS

HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



two drawing rings pinch the edges of the sheet in a squeezing grip. Though held firmly, the metal draws inward through the rings as it takes shape over the male punch.

Ordinarily in small blanking operations a small radius is left for the trimming die. Here, however, the job is so big we cut the corner and trim the flash with a friction saw. This process seemed to threaten some difficulty when first we conceived the press, yet after some thought we arrived at a method which works smoothly and economically. So, from the press the half-ventilator moves on to a special trimming machine for the second operation.

#### Saw for Trimming

First, we built a jig which rolls on a steel table. We simply place the funnel half in the jig, shove the jig onto the table and press it in a revolving motion against a 6½-inch high carbon steel friction saw revolving 9,000 r.p.m. Because the saw is mounted horizontal, it cuts a neat trim and leaves no grits. An average of 60 to 90 seconds is required for the trimming operation.

Now the two halves of the ventilator are arc-welded together. This process requires little elaboration, because it follows the orthodox procedure. It may be pertinent to point out that no riveting is required because of the method developed for varying pressures around the lower platen while drawing the sheet. In fact, the ability to vary pressures and obtain a smoother flowing draw is perhaps the most important single attribute of the press.

Next, the bottom and face are trimmed. The ventilator goes back to the trimming jib for these steps, and two passes against the friction saw give us swift, sure cuts.

Following trimming, we roll and weld collars for the vent. Here again, a little experimentation revealed we could short-cut the more obvious process of using slotted pipe. This would have required shipping pipe from the east, cutting a slot ⅛-inch wide in each 20-foot section of ½-inch or ¾-inch pipe, rolling it into a circle, welding the ends, then welding the pipe to the ventilator. Such a procedure seemed wasteful, and so we had constructed a series of roller dies which would form 11-gauge steel rib-

Weber engineers developed a new method for trimming the flanges. Half of each funnel is turned against a 6½-inch high carbon steel friction saw revolving at 9,000 r.p.m. Operation requires 60 to 90 seconds.

bons into the desired shape. Six sets of rolls driving from the same gearing progressively squeeze the steel ribbon into a pipe with a ⅛-inch slot.

We have then a straight pipe. Now it must be rolled into a circle, which causes the slot to close. Arc-welding closes the loop. Next, the welded ring is rolled over a tooth which opens the slot once more. The strengthening ring now is driven with a hammer slot-wise over the edge of the ventilator, and arc-welded in place. Incidentally, this yields an excellent joint whose remaining cracks and crevices fill with hot zinc during galvanizing.

Similarly, a band of steel measuring ½ x 2-inches now is rolled and welded closed, slipped over the sleeve of the funnel and arc-welded. This band not only strengthens the structure as a whole, but readies the sleeve for attachment to the funnel proper at a later time. Welding the vent to the funnel may take place in our plant, or at a shipyard. The former practice generally prevails now.

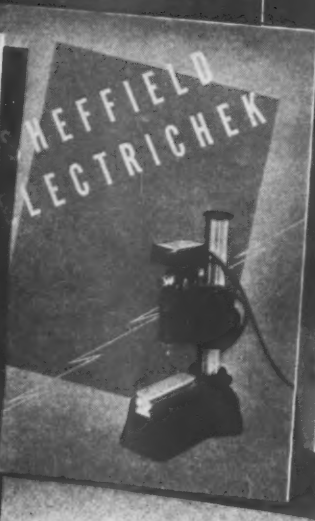
When the funnel is complete, we grind the weld and bead and sand blast inside and out preparatory to obtaining maximum results from the hot galvanizing job. Galvanizing, is a standard procedure. Finally, in preparation for their jobs at sea, screens are installed. These structures serve the dual purposes of collecting debris and breaking the force of water when the vessel is ploughing through heavy seas. I have never calculated the force exerted by the wind and water on a large ventilator, yet the total must be considerable. We want these units to withstand the roughest usage. They are vital to efficient operation of the Liberty fleet.

#### Tribute

Construction of the press, without which we could not fabricate ventilators of the size and numbers required, is a fine tribute to the Tool Engineers of Los Angeles. As for the larger ventilators, we first actually fabricated each half in several parts and welded

(Continued on page 114)

THE TOOL ENGINEER



## ONE OF THESE BOOKLETS *may break* *that inspection bottleneck*

Here are five booklets covering many of the types of Sheffield Gaging instruments. They present some of the most important advancements in the gaging art.

One of them may break that inspection bottleneck—improve your inspection practices—lower your costs.

**"SHEFFIELD PRECISIONAIRE"**—Describes the most modern air gage for checking all types of bores including long, inaccessible bores such as rifle barrels. Little skill is required to operate the Precisionaire—high accuracy and speed are obtainable by any operator with minimum training.

**"SHEFFIELD ELECTRICHEK"**—Describes the Electrichek, a fast, accurate gage for high production. Particularly useful where inspectors must be recruited from less skilled workers.

**"SHEFFIELD VISUAL GAGE"**—Describes a gage of wide range of usefulness—available in laboratory or tool room models, reading to millionths—and in production models reading to "tenths." Very easy to

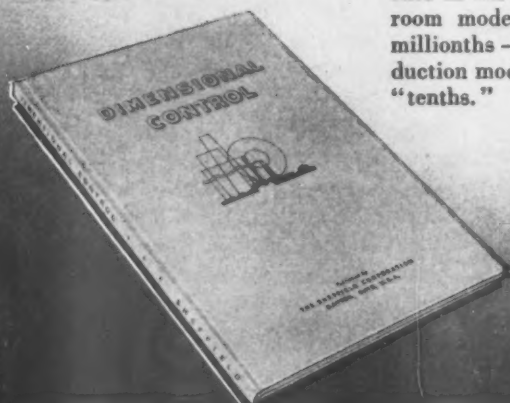
operate—extremely rugged in construction.

**"SHEFFIELD MULTICHEK"**—Describes the fastest and most useful gage available for checking several dimensions at once. The Multichek is relatively simple to set up—very simple to operate after setting. Widely used on shells, fuses, ordnance parts, etc.

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**"DIMENSIONAL CONTROL"**—"Dimensional Control" is a new basic text on gages and their use in industrial inspection. It has been written for Engineering students, members of Defense Training Courses, and men in Industry who want a more complete knowledge of this phase of their work.

This is a 64-page book carrying 82 illustrations. It is 7 3/4" x 10 3/4" with a special stiff cover and cloth binding—price \$1.50 postpaid.



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these parts together. This obviously was an unsatisfactory and uneconomic procedure. It was because of the difficulties inherent in this program we set about to design the big press.

Having decided upon the design, Weber awarded the construction job to the Hydraulic Press and Engineering Co., headed by a genius named Jack Gantz, whose long experience in engineering hydraulic mechanisms has stood us in good stead. With the

contract awarded, I set about rounding up the necessary steel. During the first six days, having moved my headquarters from Weber's to Gantz' office, I bought 190 tons of steel, obtaining it from several available local sources.

Meanwhile, we started a telephone campaign for help. Our engineers began drawing up specifications and detail drawings. Gantz began rolling, welding and fabricating cylinders.

The L and F Machine Co. built



Press Operator can handle the 21½-ton top platen like a soft boiled egg. Big rams bring the female die down at speeds varying from two inches to five feet per minute.

and welded the movable platen, and undertook considerable planer and lathe work. Emsco Derrick and Equipment Co., fabricated the base, welded the top member and turned the pistons. Western Pipe and Steel Co. rolled the large cylinders from heavy sheet steel. Down at Wilmington, the Los Angeles Shipbuilding and Drydock Corp. undertook planer work on the movable platen and the base, and bored and ground the pull-back cylinders.

What we actually did, in effect, was departmentalize our operations. Semi-finished and completed units were delivered to Gantz' plant or to our own yard. Daily I pounded the contractors for speed, and in less than three months from the day we started drawing plans, the press stood ready for operation. Such was our rush that not even yet do we possess a complete drawing of the whole machine. Detail drawings sufficed. The machine works.

And Weber is turning out a secret number of ventilators at a secret rate for a secret number of ships. We believe we are contributing an important bit to construction of the Liberty ships, in which we rightfully take pride.

#### National Emergency Alternate Steels

DESIGNATION	CHEMICAL COMPOSITION (b)				
	C	Mn	Mo	Ni	Cr
NE8024	0.22-0.28	1.00-1.30	0.10-0.20	....	....
NE8124	0.22-0.28	1.30-1.60	0.25-0.35	....	....
NE8233	0.30-0.36	1.30-1.60	0.10-0.20	....	....
NE8245	0.42-0.49	1.30-1.60	0.10-0.20	....	....
NE8339	0.35-0.42	1.30-1.60	0.20-0.30	....	....
NE8442	0.38-0.45	1.30-1.60	....	....	....
NE8447	0.43-0.50	1.30-1.60	....	....	....
NE8547	0.43-0.50	1.30-1.60	....	....	....
NE8620	0.18-0.25	1.30-1.60	....	....	....
NE8630	0.27-0.34	1.30-1.60	....	....	....

**Will the Machinability of NE Steels prove to be a Tough Problem?**

**T**HE answer will be "Yes" or "No"—depending upon the skill used in handling the change-over.

Changes may be required in tools and tooling; changes in speeds and feeds, and in cutting fluids. When this last factor is considered

#### Stuart Oil

#### Engineering Service

is equipped and ready to help you apply the Right Cutting Fluid to "cranky" steels.



**Stuart's Thred-Kut**  
HEAVY DUTY CUTTING OIL  
Recommended by America's leading machine tool builders

**Stuart's SOLVOL**  
LIQUID GRINDING COMPOUND  
For carbide tools and where an "aqueous" solution is recommended

**Stuart's CODOL**  
LIQUID GRINDING COMPOUND  
Meets every test for the Ideal Modern Grinding Compound

**Stuart's "SUPER-KOOL"**  
AMERICA'S FIRST TRANSPARENT SULPHURIZED CUTTING AND DRILLING OIL

For All Cutting Fluid Problems  
**D. A. STUART OIL CO.**  
Chicago, U.S.A. • LIMITED • Est. 1865  
Wholesaler for All National Machine Tool Dealers

# If no two men have the same sense of touch— NEITHER HAVE FOUR



**6-12 A.M.**

Al's touch is tense and not always acute; it's a bit erratic.



**12-6 P.M.**

George works by "main strength". His touch is not sensitive.



**6-12 P.M.**

Bill really has a sensitive touch — except when he has a hangover.



**12-6 A.M.**

Massey is a human gage. But, he works only one out of four shifts.

**but** . . . the quality of their inspection should not be influenced by the hours of their shift, their various nervous temperaments, their physical condition, or their general experience. And that will not do today.

Precision inspection of linear dimensions requires uniform, impersonal inspection. Gaging by the sense of touch requires skill without any recourse to magnification. Gaging by sight permits magnification of the error with greater **surety of uniform observation** of the error.

It also makes inspection faster by eliminating the period of doubt while the inspector "feels" the gage as it contacts the work. With a Federal Dial Indicator Gage he **sees** the error clearly and positively. It makes no difference whether the inspector is unskilled or simply tired or whether Bill is inspecting or Massey. A Federal Dial Indicator Gage magnifies the error to where it can be quickly distinguished.

Thousands of designs for faster, more accurate gaging of war material have been made by FEDERAL. Maybe one of them would help you. Why not find out?

**FEDERAL PRODUCTS CORPORATION**  
1144 EDDY STREET PROVIDENCE, R. I.



A typical Dial Indicator Snap Gage which shows the exact variation in size. It does not depend upon the uncertain "feel" of the common fixed type of gage.



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**PRECISION MEASURING INSTRUMENTS**

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(Continued from page 73)

essing men worked out a partly automatic apparatus. Even this was not fast enough for high production.

Then, the inspector who had operated the test started work on a new idea. The result was a machine that was completely automatic, eliminated all operator errors, gave a better check than old methods, permits application of positive pressure and furnishes a complete view of all sides of the casting by means of lights and mirrors. Working on a sensitive drill press that performed a countersinking operation at Cadillac Allison, a machinist suggested that the tool be fed into the work by use of a weight on a lever of the press instead of by hand. Use of the weight did not tie him down to one operation, but enabled him to work on another spindle while the weight fed the work.

### Simplicity Counts

Some suggestions are absurdly simple and have resulted in multiplying production many times. Take, for example, an idea offered by a painter in the concern's Guide Lamp Division. He designed a better arrangement of hooks on hangars used on paint-dipping the small doors of blackout lamps. The result was an increase of approximately 14 per cent in production.

What plant superintendent wouldn't like to speed production 14 per cent in any one of his departments without employing more labor?

Most of the war products being turned out are new to the men in the plants — engineers and supervisors. Many of the processes and machines are also unfamiliar. Under these conditions, one engineer at General Motors said it was only to be expected that many suggestions for improvement would be forthcoming. From the individual's standpoint an official said, "we felt it is only fair to return to him a share of the saving resulting from his suggestion."

This policy of management award, as well as recognition by the War Production Board in the form of certificate of "Production Merit" has had a stimulating effect on the employee suggestion program. At GM, awards range from a few dollars in defense stamps to \$1,000 in War Bonds.

Another stimulant to employee

suggestions conceived by an automobile concern is the encouragement of workers to file patents on those ideas of a patentable nature.

At Packard Motor Car Company, a much smaller organization, such a program brought 4,158 suggestions from workers in a few weeks. More than 200 of these ideas cover production betterment and have been carefully checked and placed in practice.



**Would you like to step up production 50 per cent? In hundreds of plants this is being accomplished by seeking ideas from men and women in the shop.**

Experience at Packard proves that when historians record what the war contributed to industry, the shop suggestion idea will be listed as permanent. In this concern, as in hundreds of others throughout the country, it not only has bettered relations between workers and company, but has jumped volume output.

Put into practical terms, one idea just accepted there is the equivalent to stepping up production one Rolls-Royce Merlin engine a month. This proves the contention of George T. Christopher, president and general manager, that the production drive is a speedup of machines and not men.

The idea which jumped the automobile concern's production one big

engine monthly was submitted, strangely enough, by a former auto salesman who works as a repairman on aircraft engines. His suggestion changed the testing procedure on the Rolls engine crankcase, preventing costly teardowns.

Valuable ideas come not only from shop veterans, but new-comers including women. One of the most interesting described at the Packard plant was suggested by a young man recently graduated from high school. He has discovered a process that increases the life of a valuable tool 300 per cent and at a cost of only 25 cents. Cutting tools are at a premium and plants are spending many times the value of one of the tools to keep it in operation.

### Started 32 Years Ago

In this factory, usable shop suggestions have come from many types of workers including an acetylene welder, assistant foreman, engine assembler, floor checker, gang leader, gage maker, job setter, major inspector, motor repairman and utility operator. Crude drawing and rough sketches are often submitted by workers to illustrate their ideas. Pictures were submitted at Packard for such ideas as a machine drill to replace a hand chamfer operation, a fiber cover over part of an engine assembly to protect it during construction, a screen box instead of the hand to hold small parts for inspection washing.

In a few companies engaged in war production, this "Battle of Wits" is not new. It has been going on for 32 years in plants of the Westinghouse Electric and Manufacturing Company, which inaugurated a Suggestion System at its East Pittsburgh works in 1910. During those years, idea-minded workers have saved an estimated \$1,250,000 in time and materials.

To date, employees of this concern have offered 102,000 written suggestions, and nearly one-third have been put into practice to increase production, improve methods of manufacture, save materials, or provide greater safety. Westinghouse has always rewarded workers with usable ideas. Since one 29 year old workman began assembling delicate electrical metering instruments for the company in 1938, more than 330 of

(Continued on page 174)

*Here's Capacity-  
1½ inch High Speed  
Twist Drills in Steel*

**CAN be driven  
by this BAKER  
QUICK CHANGE  
DRILLING MACHINE**

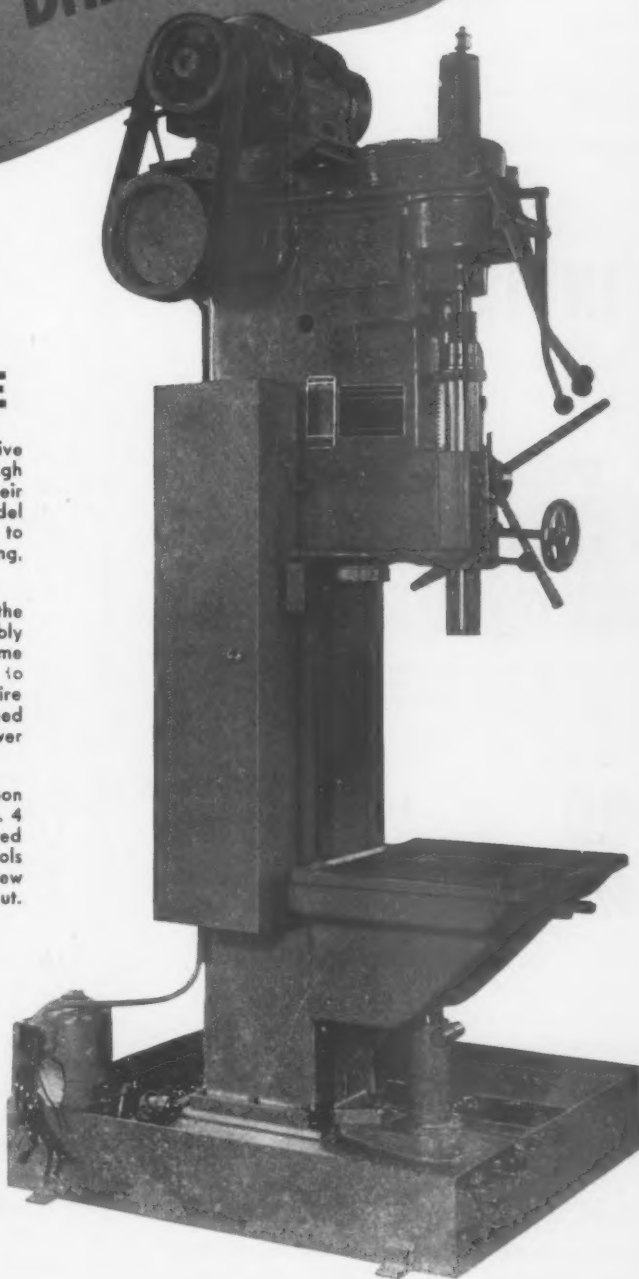
This machine has ample capacity to drive one and one-half inch diameter high speed twist drills to the limit of their efficiency in steel. This BAKER Model 150 drilling machine is also adapted to boring, counterboring, facing, forming, and tapping operations.

● To give increased flexibility to the machine, the vertical column assembly is of 2-piece design. The lower frame bolts to the base and is arranged to carry standard plain table. The entire upper unit assembly with speed and feed train drives is mounted on the lower frame.

● The spindle is a forged high-carbon steel with the spindle nose carrying No. 4 Morse Taper. The spindle end is fitted with a cross-slot for holding heavy tools and is provided with a hollow set screw to prevent lighter tools from dropping out.

*Features  
of Model 150*

1. Multi-Vee Belt Drive
2. Multi-Splined Spindle Drive
3. Two-Piece Frame Design
4. Capacity: 1½ inch Diameter Drill In Solid Steel



**B  
A  
K  
E  
R**

**BAKER BROTHERS, INC. TOLEDO, OHIO**

**DRILLING • BORING • TAPPING • KEYSEATING MACHINES**

(Continued from page 76)

how the desired objective can be obtained at the lowest possible cost despite almost constant rises in labor or material costs.

The Tool Engineer is constantly alert to prevent the manufacture of an article which might reach the market at too high a cost. In this latter case redesign of the product, while not his responsibility, is often recommended and carried out.

In most organizations, Tool Engi-

neering is considered an engineering duty and is supervised by the Works Manager, General Superintendent or Master Mechanic. Its direction is separated from other engineering or manufacturing control to prevent interference or an overlapping of authority which might improperly influence decisions. This may be likened to separating manufacturing supervision and product inspection. If both were under the same supervision the Manufacturing Supervisor might

instruct the Chief Inspector to pass defective parts. Product and Tool Design being closely related to Tool Engineering should, however, be kept under separate supervision.

The Tool Engineer should be sufficiently familiar with product design to know how it affects tool design because it is the express function of the Tool Engineering Department to plan the Tool layout. The heads of the Tool Engineering and Tool Design departments should be on par in regard to authority.

Tool Engineers must be ever cognizant of the productive capacity and ability of production workers. All Tool and Production layouts should be first considered from a standpoint of safety and fatigue to the operator. These are also considerations of the Tool Designer and in this case the Tool Engineer can act as the final checker. Ideas from Production Foreman and workmen should always be considered and used if they are found to be adaptable, for it is upon them as well as the tools, that production depends.

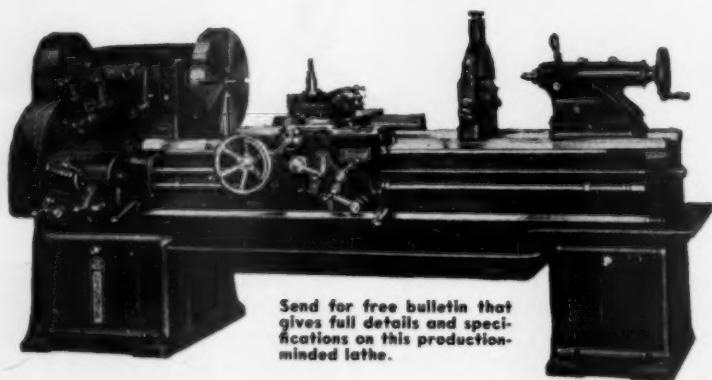
#### Further Considerations

Other limitations affecting efficient Tool Engineering are the type, quantity and condition of the machine tool equipment and its location in the plant. This is important with regard to stock handling, trucking, storage, shipping, etc. The lay-out of a production department should be planned with view of minimizing stock handling in all its phases. Condition of the production equipment must be adequately maintained as quality workmanship or quantity production cannot be expected or attained from equipment in poor working condition.

The quantity of equipment and its particular kind must be kept properly proportioned and provisioned by the amount of production of the various operations required such as mill, drill, stamp, turn, grind, etc. Too many jobs assigned to one machine invariably results in difficulties.

The latter is a function of a Work Planning or Scheduling Department. The duties of this department are not a function of Tool Engineering, but there is sufficient relationship of its operations to vitally concern Tool Engineers.

## "RUGGED INDIVIDUALISM"



# BRADFORD

*Metalmaster*

# LATHE

This rugged new lathe is just the machine for the fast tempo of war production! The headstock, driven by a constant speed standard frame motor, is rugged, simple, and exceptionally free from vibration. Heavy walls and a sturdy center bracing rib supports at the short intermediate gear shafts in tapered roller bearings. Double wall one piece apron,—wide range quick change device and many other features which you will find in booklet. Write for your copy today.

ALSO MANUFACTURERS OF DRILLING AND TAPPING EQUIPMENT

## THE BRADFORD MACHINE TOOL CO.

CINCINNATI, OHIO

PRECISION TOOLS SINCE 1840

# How a Transparent Duplicate

## *HELPED MOVE*

### a Factory...



#### BASIC FACTS ABOUT PRINT MAKING YOU SHOULD KNOW

OZALID TRANSPARENT FOILS ARE USED TO MAKE COMPOSITE PRINTS—The extreme transparency of Ozalid foil allows using multiple layers at one time to make a composite print. Thus, if you have separate details—each on a different foil—which you want brought together in one print, merely place the foils, one on the other, and feed with a piece of Ozalid sensitized material into the whiteprint machine.

Consequently, you can make prints which will show such details as plumbing and heating, power and pipe lines, etc., either separately or combined.

Foil copies of original drawings are made the same as standard whiteprints.

SPECIFY *Ozalid* WHITEPRINTS

**A** LEADING MANUFACTURER wanted to move into a more desirable building—but hesitated when he saw estimates of the time which would elapse before he could begin production.

Ozalid then showed how five hundred hours could be saved in drafting time alone! First, instead of making multiple drawings of the master floor plans—Ozalid transparent duplicates were quickly made. The draftsman then added—direct to the duplicates—the plans for machinery layout, ventilating and heating, transmission and beltings, electrical and plumbing connections, etc. These duplicates were used to produce the desired number of work prints. Thus, in changing over . . . time and labor were saved.

Today, many manufacturers are reorganizing factories and assembly lines . . . making frequent changes in product design. And the Ozalid Process is giving them a "head start" in vital war production. An Ozalid whiteprint machine turns out standard and transparent prints in two quick steps—Exposure and Dry Development . . . without the wasteful tie-ups which are a part of "wet" developing methods. And Ozalid's wide variety of sensitized materials allow you to: cut drafting time . . . speed the making of corrections . . . turn out whiteprints which will have the most "back bone" in the busy shop or sun-baked field.

Write for new catalog. See how the Ozalid Process can help you!

### OZALID PRODUCTS DIVISION

GENERAL ANILINE & FILM CORPORATION

JOHNSON CITY, N.Y.

Ozalid in Canada • HUGHES OWENS CO. LTD., Montreal

## JOB REQUIREMENTS IMPORTANT TO TOOL DESIGN

**ROBERT H. OAKES**  
Mechanical Engineer

IT seems reasonable to expect to find considerable reliable information on cutting tools—more so than with jigs and fixtures as cutting tools have been standardized to some extent. Yet information is often vague and contradictory. Let us take a standard tool, so called, for example the reamer, and see just what we get.

A student in a defense school is

given the problem of designing a machine reamer or a hand reamer, of given size. He determines the general proportions based on diameter, the American Standard, and some table he has found in a small tool catalog. He proceeds to block in the drawing and all goes well until he discovers that according to the American Standard he may have six or eight flutes at the discretion of the manufacturer. Finding that one manufacturer

offers a high-speed reamer of his size having four flutes, he falls upon the happy choice of seven flutes; six evenly spaced and the seventh—well the handbook said the flutes should be unevenly spaced and seven doesn't go into 360 degrees evenly anyway.

The next point to engage the students attention is the matter of width of land and depth of flute. Consulting several supposedly reliable references, he finds, that for his particular reamer, the land may be .045-inch, .062-inch or .10-inch. He learns that the land shall be narrow to dispel the heat. If he were designing a hand reamer, no great amount of heat would be generated therefore the land could be wide. But the purpose of the wide land is to insure the cutting edge standing up under the heavy cut. Removing just a few thousandths of an inch of metal may not be considered heavy cutting, therefore the land can be narrow. No mention is made of flute depth.

### Formulas

At this point the student asks if all tools are designed by guess work or are there definite formulas. Yes, there are formulas given by a reputable manufacturer. They must be satisfactory for the manufacturer claims over thirty years constant use to the exclusion of all others. Yet the instructor knows in his own mind that they are not quite right. But the student is happy to learn that, based on standard reamer fluting cutters, the width of land equals .8 diameter divided by the number of flutes with the depth of flute attained by a similarly simple formula.

However, where the ancient formula might work with a zero rake, it is slightly out of whack if positive or negative rake angles are to be considered, especially when combined with spiral flutes. Explaining away this discrepancy is not too difficult as shifting the reamer blank relative to the cutter will produce the correct land width and rake angle, but only at the expense of the flute depth.

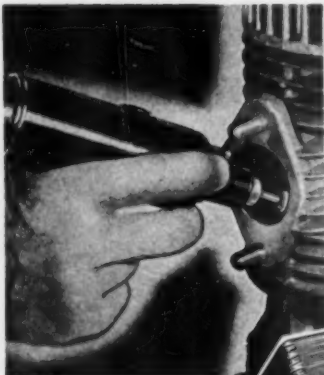
Somewhere it is written that two adjacent flutes shall overlap in the length of the hole to be reamed. The student finds that the helix angle shall be greater than seven degrees but may not exceed forty-five degrees. Further, the helix should be right hand for blind holes and left hand for through holes. When he submits his

(Continued on page 122)



## MOTO-TOOLS

### SPEED UP WAR PRODUCTION



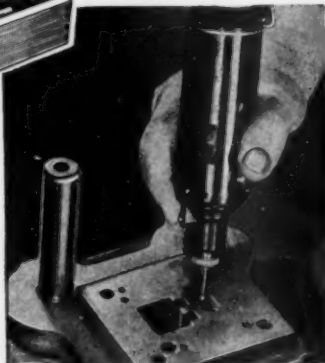
Above: Moto-Tool is ideal for getting into close quarters, grinding, buffing and finishing to required specifications. Can be used for metal, wood, plastics, porcelain, glass, and other materials.

Dremel Moto-Tools are speeding up war production in defense plants from coast to coast. These rugged tools tackle grinding, routing, buffing and finishing jobs with speed and precision . . . faster and easier, especially in close quarters . . . in hard-to-get-at places.

A Dremel Moto-Tool has a shock-proof bakelite housing, oil-sealed bearings, and a balanced armature to eliminate vibration and produce finer finished surfaces. It weighs only 13 ounces . . . can be hooked up to any AC or DC outlet. Used in America's leading arsenals of democracy . . . by General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Northrop Aircraft, and many others.



Below: Tool makers find Moto-Tool's sensitive, finger-tip control indispensable when shaping intricate or irregular metal dies. For grinding or cutting with steel accessories . . . it can't be beat for convenience and adaptability.



The complete Moto-Tool kit has accessories for all types of grinding, buffing and finishing operations . . . with steel cutting tools and the best abrasives. Consists of 1 Model 2 Moto-Tool with 3 collets: 1/8", 3/32", and 1/16", 4 Emery Wheel Points, 1 Dressing Stone, 8 Carving Cutters, 1 Steel Saw, 3 Bristle Brushes, 1 Steel Cleaning Brush, 1 Screw Mandrel with Sanding Discs, and 1 Shoulder Mandrel, one 1/2" Drum Sander. Packed complete in sturdy felt-lined hardwood cabinet case \$23.50. Dremel No. 2 Moto-Tool only \$16.50.

### 10 DAY TRIAL



See genuine Dremel accessories for precision work. Steel cutters (above) can be used for carving, routing, or engraving wood, bakelite, plastics and soft metals. —See catalog. Dremel points are made of the best abrasive in proper grit and grain for grinding practically any kind of material.



DREMEL MFG. CO., 1442-J, Racine, Wis.

Try Moto-Tool for 10 days in your own shop. See how versatile, how indispensable it can become to fast, accurate work. Order from your supply house or send direct.

DREMEL MFG. CO., 1442-J, Racine, Wis.

We would like to take advantage of your ten day trial offer. Enclosed find our purchase order for the following:

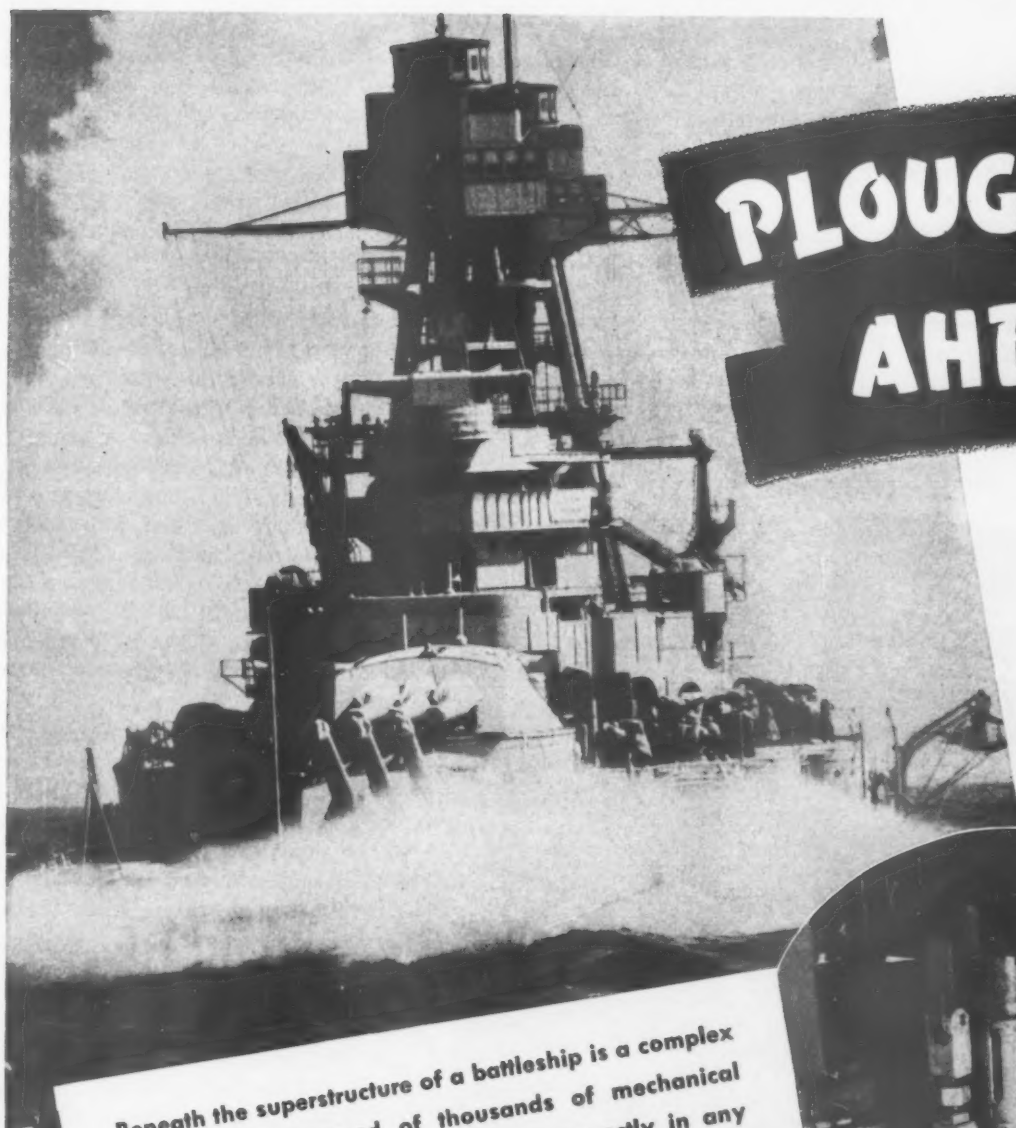
- ☐ Complete Moto-Tool Kit No. 2 (\$23.50)
- ☐ Moto-Tool Model No. 2 (\$16.50)
- ☐ Catalog of Dremel Tools and Equipment

Firm.....

Name..... Title.....

Address.....

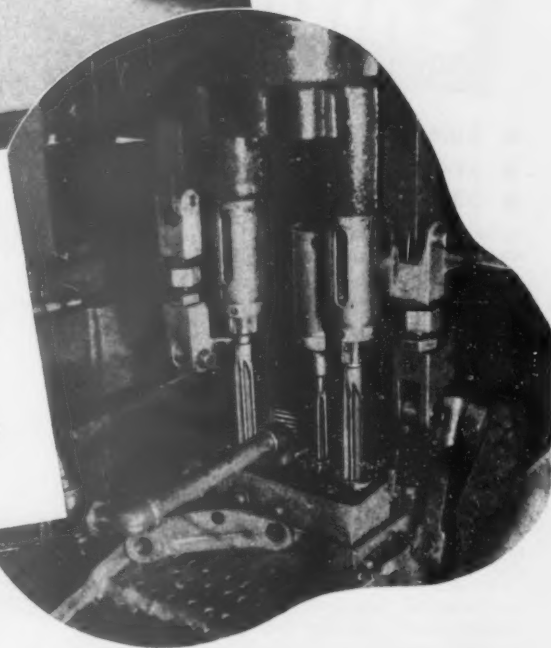
City..... State.....



**PLOUGHING  
AHEAD**

Beneath the superstructure of a battleship is a complex mechanism composed of thousands of mechanical parts. Whether these parts function correctly in any emergency is in large measure due to the quality of the tools used to manufacture them.

National Cutting Tools are tools of character, built for hard use, long life, exacting precision.



**NATIONAL**  
TWIST DRILL AND TOOL COMPANY



(Continued from page 120)  
drawing, the reamer looks like a cross between a cork screw and a broach.

All students are not like that. Some grasp fundamentals and apply them.

### Small Manufacturer's Problem

But what about small defense industries? What about the fellow who suddenly finds he has been awarded a contract to manufacture something, only to find that he has a limited experience in machining the material re-

quired and almost no tools. The experience will come in due course. But what about tools?

Tools can be obtained by purchase or by manufacture within the plant, but the contract brooks no delay. Placing an order with a reputable manufacturer of cutting tools, he proceeds meanwhile with the aid of a student, to design and make his own—at least until delivery.

Having purchased reamers here-tofore, his approach to the problem closely parallels that of the student.

Out come the handbooks, the magazines, the small tool catalogs. A drawing is made, a pictorial representation of what he saw in the catalog. The toolmaker fashions and hardens and grinds the steel into a reamer. The result is comparable to a tool selected from the five and dime store. What is wrong?

Further study reveals that a certain page in the handbook was overlooked, that of reamer grinds. He learns that for certain metals a positive rake is required while for others a negative rake is suggested. Then comes a period of modifying, regrinding, cutting and trying. Days lengthen into weeks and weeks into months. Parts—his war product—are rejected because the holes were not within the specified tolerance or because the finish appeared to be produced with a forty-pitch thread chaser.

### Product Requirements Important

Nor can much be expected of the reamers he ordered, unless specifications are guided by the requirements of the new product.

Following are specifications for a general purpose reamer which have been proved effective for a wide range of work. To begin with, the general proportions shall be those adopted by the American Standards Association. The number of flutes shall be determined by standard practice. As for the flutes themselves, they shall have a spiral lead sufficient to produce a helix angle of seven degrees, left hand for through holes and right hand for blind holes. The width of the land shall be .8 diameter divided by the number of flutes, and shall be relieved to provide a margin of .010-inch on hand reamers and .020-inch on machine reamers. A positive rake angle of five degrees is recommended. Machine reamers shall have a back taper of .0008-inch per inch of flute length.

Hand reamers shall have a back-taper of .0002-inch per inch of flute length and in addition shall have a starting taper of reasonable proportions. That is to say, the taper should not be based on any set rule of one-half degree or three degrees but should be a gradual taper, the small end of which will enter the hole to be reamed whether .002-inch or .020-inch of metal is to be removed. If the work-piece is of such a design that a reaming fixture is indicated, a pilot may be provided as shown in the American Standards design.



*Announcing*  
**THE IMPROVED**  
**1/4 INCH**  
**SKILDRILL**

- RUNS QUIETER
- STAYS COOLER
- DRILLS HOLES FASTER!

If you've seen SKILDRILL or heard about the thousands of SKILDRILLS in war plants, you know it's perfect for easy, top-speed, day-long drilling. And now you should know that SKILDRILL has been improved... with new special features that put it even farther ahead of every other 1/4-in. drill in the market!

We improved the gearing... made SKILDRILL run quieter than ever without adding an ounce to its easy-handling 2 3/4 lbs.!

We stepped up the cooling system... made this cool drill run COOLER without making it bigger (only 2-9/16 in. wide and 6 3/4 in. long). And we offer SKILDRILL in 4 SPEEDS to give you peak performance on whatever material you use... to speed up every production drilling job in your plant. Ask your distributor to demonstrate new, improved SKILDRILL today!

**SKILSAW, INC.** 5051 Elston Ave., Chicago

New York • Boston • Buffalo • Philadelphia  
Cleveland • Detroit • Indianapolis • St. Louis  
Kansas City • Atlanta • New Orleans • Dallas  
Los Angeles • Oakland • Seattle • Toronto  
Canada

EVERY MAN  
COUNTS FOR MORE  
USING SKILSAW TOOLS!

**THESE SPECIAL FEATURES**

- New Quieter, Smoother Gearing!
- New Improved Cooling System!
- 4 Speeds Available!

For fastest drilling on any material

1800 R.P.M.  
2500 R.P.M.  
3500 R.P.M.  
5000 R.P.M.

**SKILSAW** PORTABLE ELECTRIC **TOOLS**

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

\$32<sup>50</sup>

# Don't Scrap a Tool! Scrap a Jap!

"PLEASE, HONORABLE SCRAP ARE NO GOOD"



Scrap cutters and tools should be salvaged and reconditioned so that they can be put into this fight.

Worn tools, cutters, drills, reamers, end mills, etc., lying around the shop should be fighting for you.

Our complete tool reconditioning service will help put these tools into "the fight" by increasing this country's vital war production.

## A COMPLETE RECONDITIONING SERVICE FOR TOOLS



EASTERN CUTTER SALVAGE CORPORATION, 30-32 LITTLETON AVE., NEWARK, N. J.

Western Plant • MASTER TOOL CO., INC., 5605 HERMAN AVE., N. W., CLEVELAND, OHIO

Chrome Plant • MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO



Any Shape  he Draws

A UNISHEAR can Follow!



... and cut it  
**FASTER**  
than any other tool!

Wherever sheet metal departments are "beating the promise", you'll find Stanley Unishears on the job. They slice through sheets as fast as you feed, up to 15 feet per minute – follow any line accurately, straight, curved or angle – leave smooth, clean edges with no distortion. Plenty of power and ruggedness for tough production or maintenance use.

Portable models with capacities up to 12 U. S. gauge hot rolled steel. Stationary models to handle sheet metal up to 10 gauge. Stanley Electric Tool Division, The Stanley Works, 149 Elm St., New Britain, Connecticut.



**STANLEY UNISHEARS**

*The Electrically Driven Hand Shears*

TOOLS ARE THE WORKER'S WEAPONS  
IN A TOTAL WAR. KEEP THEM ON  
THE JOB WITH PROPER CARE....

# a Complete Line of Torque Wrenches

Constructed for exacting laboratory work or continuous production use. A practical wrench correctly engineered **PERMANENT ACCURACY**. A capacity and size to fit your needs.

**MORE**

Accuracy

Life

Speed

**3 DIALS**



**NO** FRICTION  
ADJUSTMENTS  
MOVING PARTS  
FRAGILE MECHANISMS

**SPECIAL T HANDLE STYLES WITH MAXIMUM CAPACITIES FROM 100 TO 7200 INCH LBS.**

## No. F100

Recommended for capacities in foot lbs. from 0 to 100, graduated in steps of 5 foot lbs. Other sizes shown range in maximum capacities from 25 to 600 foot lbs., and from 25 to 7200 inch lbs. When ordering state capacity needed.



PIONEER MANUFACTURERS OF ACCURATE MEASURING WRENCHES

**P.A. Sturtevant Co.**  
**ADDISON QUALITY ILLINOIS**

# CP SPECIAL-PURPOSE SCALER CUTS TIME 50%



↑ **SCALING WELDS** on a flame-cut steel bed with the CP 800 Special-Purpose Scaler in one half the time previously required for the operator to do this work with a file.

## SCALES WELDS ON FLAME-CUT STEEL IN HALF THE TIME

### New CP Tool Has Many Uses

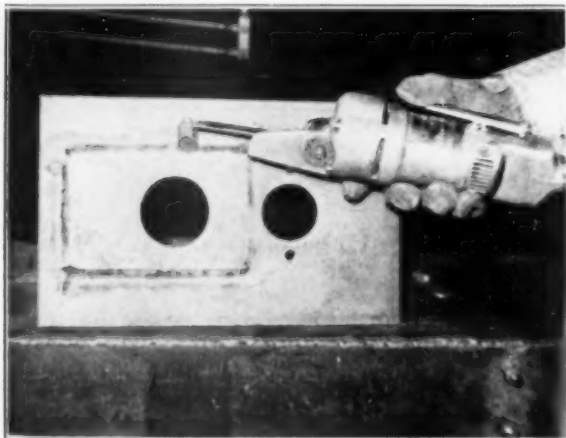
NEW YORK (CP)—By chipping weld flux and scaling the welds on a flame-cut steel deck with a CP Special-Purpose Scaler instead of filing, a manufacturer of heavy machinery has reduced scaling time exactly one half.

Other manufacturers have found this Universal Electric Special-Purpose tool helpful in reducing costs by using it for chipping, peining, vibrating small moulds, cleaning firebrick and similar operations.

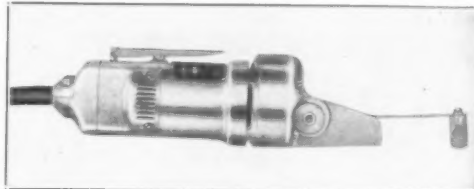
Write for further information on the CP 800 Special-Purpose Scaler; also on other CP Universal Electric Tools.

**CHICAGO PNEUMATIC**  
TOOL COMPANY

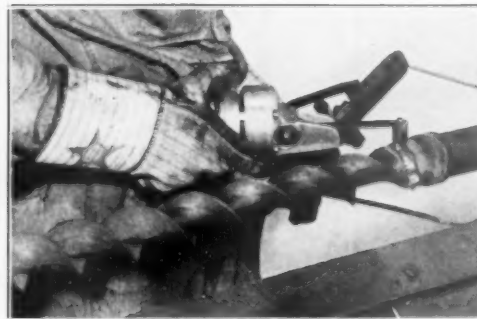
General Offices: 8 E. 44th St., New York, N. Y.



**CHIPPING WELD FLUX**  
In the operation of welding shanks and cutter heads on coal augers is another of the many uses of the Chicago Pneumatic 800 Scaler.



↑ **RAPID BLOWS** of the Universal Electric Motor-driven Spring Hammer of CP Special-Purpose Scaler speeds scaling of electric welds in plant of heavy machinery manufacturer.



↑ **SPRING FLEXING** aids fast, clean scaling. Chisel head illustrated is standard equipment. Combination chisel and cleaner head (adaptable to peining) and 12-point cutter head for cleaning are also supplied with CP 800 Special-Purpose Scaler. For complete details, write for Catalog 899.

CHICAGO



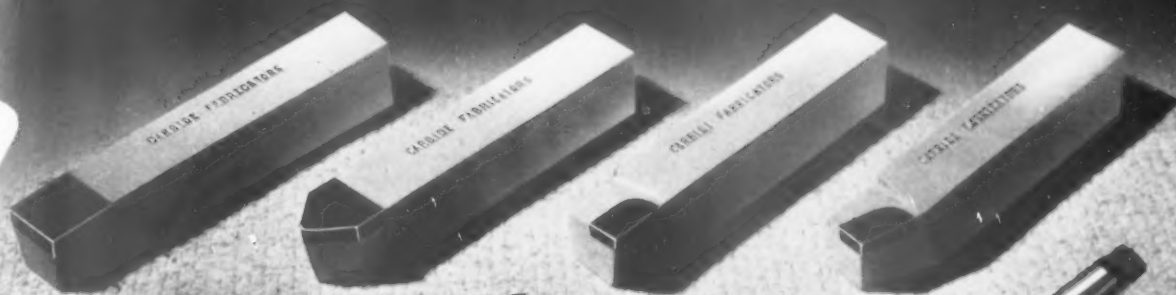
PNEUMATIC

## ELECTRIC TOOLS

ALSO: Air Compressors, Pneumatic Tools, Hydraulic Aviation Accessories, Diesel Engines, Rock Drills

BICYCLE  
and UNIVERSAL  
Drills  
Reamers  
Nut Runners  
Screw Drivers  
Grinders  
Sanders  
Tappers

To Meet Your *Immediate* Requirements  
For **TURNING, FACING, BORING and REAMING JOBS**



**STANDARD**  
*Cemented-Carbide Tipped*  
**TOOLS**

• Illustrated are the standard tools produced and stocked by Carbide Fabricators. Even under present conditions, our rapidly increasing production of these tools makes it possible for us to meet almost all delivery requirements. They are available for use in your present production — when you need them most.

The tools shown above will meet the majority of your needs for turning, boring and facing operations. Types are available for cutting of non-ferrous materials, cast iron, bronze, etc., and also for steel cutting.

Carbide Fabricators' standard reamers meet innumerable requirements in present day production. Expansion reamers are absolutely positive in locking for size. They provide maximum expansion of blades to provide long life. (Expansion of .030" in half inch reamer.) Their simple construction assures trouble-free service. Solid reamers are held to extremely close tolerances, and manufacturing methods such as the hardening of bodies to Rockwell 58C assure exceptional durability.

WRITE FOR COMPLETE CATALOGS LISTING  
SIZES AND PRICES

We are authorized suppliers of Carboloy, Vascoloy-Ramet and Firthite cemented-carbides.



*Carbide Fabricators*

ROYAL OAK  
MICHIGAN

DIVISION OF MORSE TOOL COMPANY • DETROIT

# PRODUCTION PERSPECTIVES...

News Review of Mass Manufacturing



## Confusion

News from the production front last month presented a confusing picture. First we were told American industry is performing miracles in war production. Then, in what now looks like sniping at WPB Chief Don Nelson, it was "revealed" that the results have been disappointingly inadequate, that everything is in a mess of ineptitude.

The observer on the side lines, the Tool Engineer on the production line, could not assemble the jigsaw puzzle picture. It has been suggested such an effect was desired by the government. It was thought at first that a cheerful picture would give little comfort to the enemy, later, possibly, an idea prevailed that bad news would keep production workers knuckled down to the task of doing and doing without whatever is necessary to win the war.

It looked as though the "war of nerves" was being applied on the home front as well as in enemy capitals.

## The Answer

August 22, marked the end of this period of public confusion. On that day, pipe smoking production boss Nelson, back from an energy-retrieving vacation on which he slept around the clock, blasted his snippers with both barrels, told the nation what it wanted to know. With figures he killed

as blatant misrepresentation the story that production had "bogged down." He denied flatly the charge that there is a shortage of raw materials, bravely admitted that only a better distribution of what we have is necessary. He admitted that some plants have had to slow down, denied that the number is anything like the "1,200 shutdown" figure circulated by certain Army quarters suspected of wanting to take production control from the hands of men who know production.

Does that mean confusion? Nelson said no! The fact is, we have increased our productive capacity so fast that it can now chew up more raw materials than we can supply.

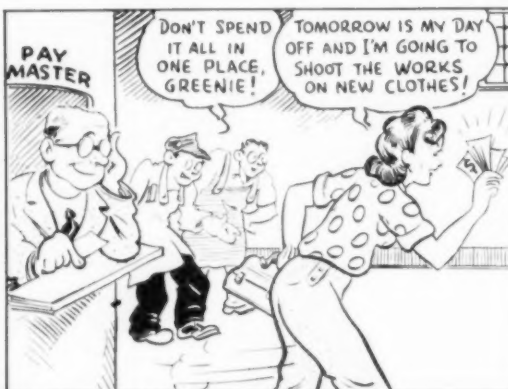
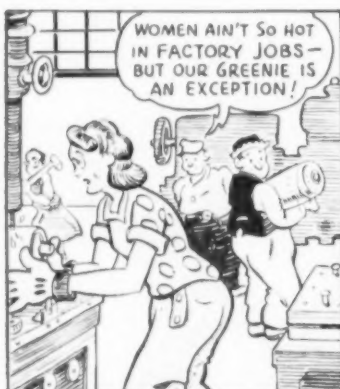
Then how can it be said there are no shortages? Because the measure is not what we can make, but what we need for a balanced program to bring the maximum impact of the nation's force against its enemies. We are not striving to produce an unlimited supply of everything, but what is necessary to carry out the specific strategic tasks our military leaders have laid down.

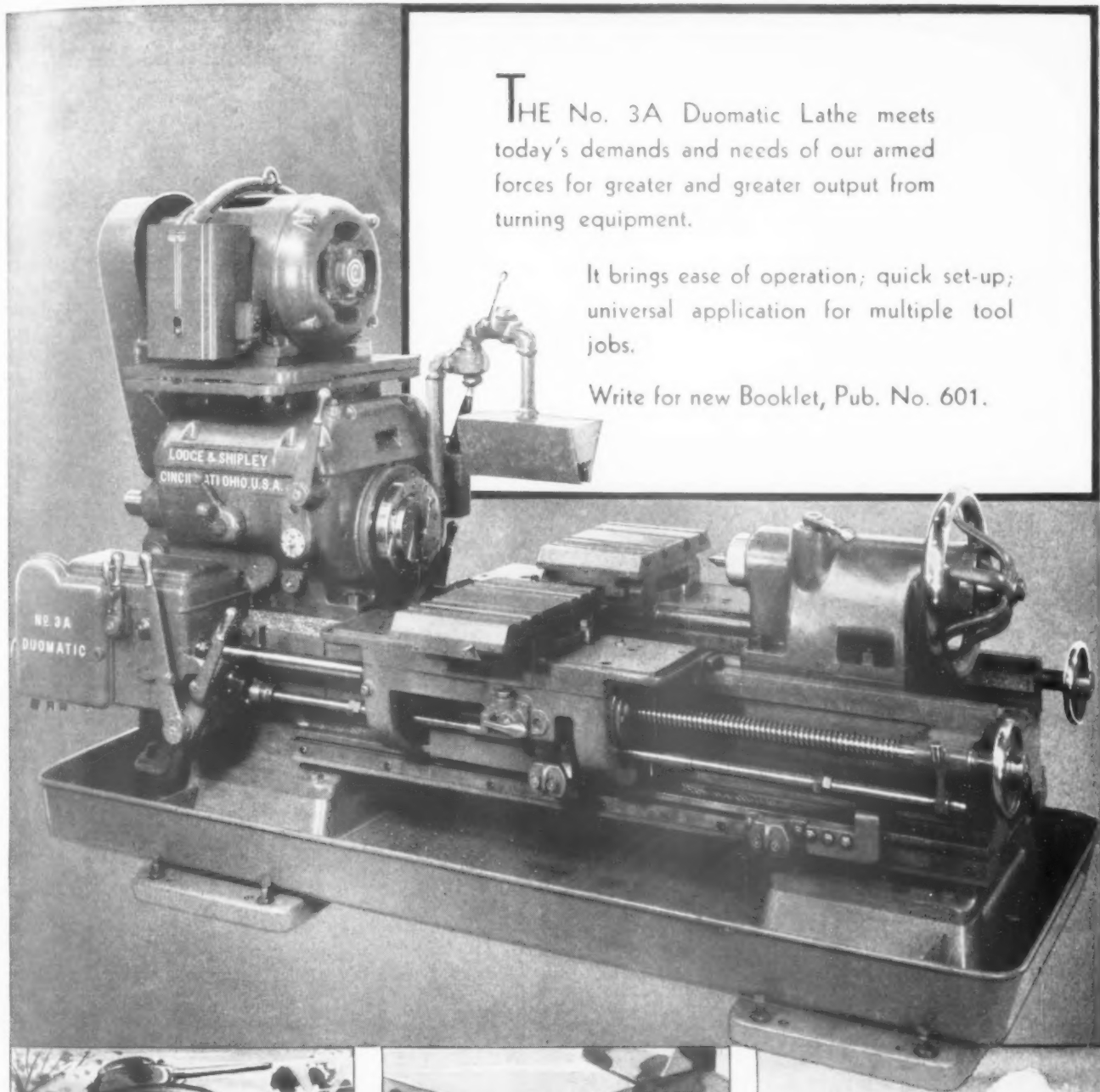
The Nazis have far less steel than we have, one twelfth of our copper supplies, yet they have been fighting at a terrific pace for several years.

(Continued on page 130)

## "GREENIE"—

## Pants is Pants

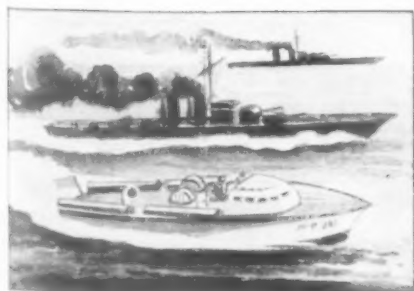
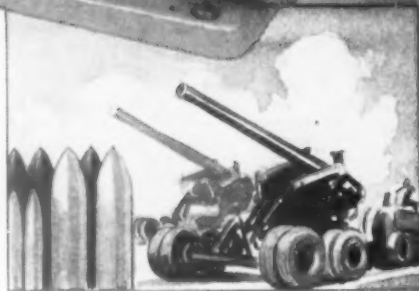
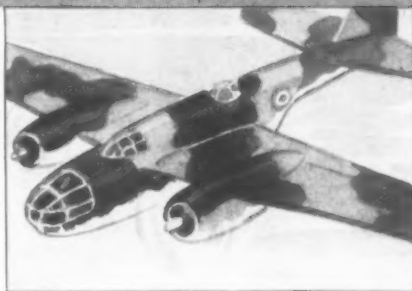




THE No. 3A Duomatic Lathe meets today's demands and needs of our armed forces for greater and greater output from turning equipment.

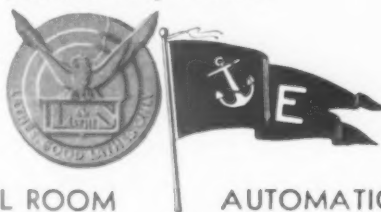
It brings ease of operation; quick set-up; universal application for multiple tool jobs.

Write for new Booklet, Pub. No. 601.



**THE LODGE & SHIPLEY MACHINE TOOL CO.**  
**CINCINNATI, OHIO**

since 1892



ENGINE

TOOL ROOM

AUTOMATIC LATHES

(Continued from page 128)

Nelson's box score on war production for July, compared for June, quenched many a fire of fear. Here is the record:

**ALL AIRCRAFT** — Up 11 per cent.

**COMBAT PLANES** — Up 6 per cent but "not up to expectations."

**ORDNANCE** — Up 26 per cent and "very close to schedules."

**NAVAL SHIPS** — Up 22 per cent, "considerably ahead of forecasts" for major combat vessels and "materially behind expectations" for minor vessels.

**MERCHANT SHIPS**—Up 6 per cent and "nearly on schedule for the month."

The last approximate figures on numbers of weapons produced—rather than percentages—were presented by President Roosevelt in June. He said then that May aircraft production was "nearly 4,000", that tank production was more than 1,500 and that artillery and anti-tank guns amounted to 2,000.

#### Boomerang

Part of the campaign to discredit the production front was directed at the

converted automobile industry. Here, a smear attack by the country's largest picture magazine, became a boomerang that inspired every man who ever saw a production line.

To answer its critics, the industry's Automotive Council for War Production revealed:

In August, the automotive industry turned out armaments at the rate of \$13,600,000 a day and at an annual rate which exceeds by more than 20 per cent the average peacetime pace. The industry's monthly rate of production since Pearl Harbor has jumped two and one half times.

Before the close of the year, auto plants will be making monthly shipments of armament at an annual rate upwards of eight billion dollars.

When the industry reaches its peak, assuming raw materials are procurable, the auto industry will be operating on a 12 billion dollar annual basis. This figure is comparable with producing 15 million passenger cars, nearly three times top production ever achieved.

One statement by auto men Tool Engineers will understand: "The problems of adapting automotive mass production techniques are largely behind us. Today's productive levels are far higher than either our own or the Government's experts believed possible six months ago."

#### Tools

Before end products can be turned out—ships, planes, guns—tools needed to build them must be produced. Not many months ago chief concern in production was a machine tool bottleneck. It was freely predicted tools might be a permanent stumbling block.

The machine tool industry has since doubled production. Its total production in 1918 was less than one quarter of one month's output in 1942.

Despite the fact that overall industrial production has swelled to the point where raw material resources are insufficient to permit all lines to operate at peak production capacity, machine tool output continued to increase during the summer.

Reflecting the still rising tempo of the machine tool industry was the fact that the value of metal working machinery in July amounted to \$113,600,000.

The actual number of units shipped  
(Continued on page 132)

THE TOOL ENGINEER

## Announcing The Moving Of Our Offices To NEW AND LARGER QUARTERS

in the  
**BOOK TOWER  
ARCADE**

1209 Washington Blvd.

Telephone: Cadillac 7300-1-2

### Complete Industrial Engineering Service

Plant Conversion  
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Increasing Production  
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Designing of Jigs, Fixtures, Gages,  
Tools, Dies and Special Machinery

**WRITE** for quotation on the type  
of services in which you are interest-  
ed. No job too large or too small.



**American  
Designing & Engineering Co.**

1209 WASHINGTON BOULEVARD

DETROIT, MICHIGAN

## BASIC ADVANTAGES of the Three Types of Portable Power Tools

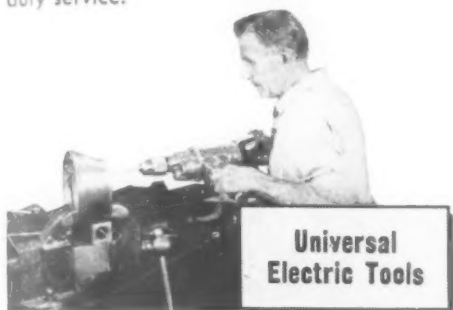
### Pneumatic Tools



Available for a wider variety of applications than any other type.

Generally of more rugged construction.

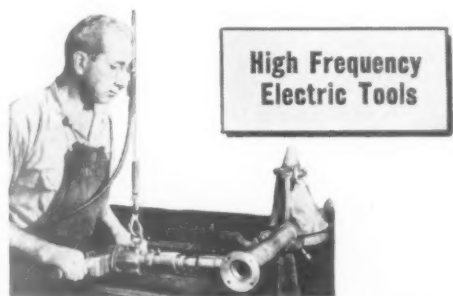
Cannot be damaged by overloading. Easily stand up under the hardest kinds of heavy duty service.



### Universal Electric Tools

Run on ordinary AC or DC electric current which is available almost everywhere.

Offer a wide range of models for all kinds of production and maintenance. Installation costs generally lowest of all.



### High Frequency Electric Tools

Lowest operating costs for users of ten or more tools.

Maintain virtually constant speed under load.

Nature of high frequency current permits simplified construction for light weight, easy handling, reduced maintenance.

**Thor**  
PORTABLE TOOLS

PNEUMATIC • UNIVERSAL ELECTRIC • HIGH FREQUENCY ELECTRIC

# "Break bottlenecks, *before they happen,* with the right type of portable tools!"



Those operations in your plant that are done with portable power tools can set the pace for production . . . or they can become "bottlenecks" — *which*, is up to you. Only with the right type of portable tools can you be sure of having the adaptability, flexibility and capacity to enable you not only to meet present needs but also to be prepared for the future. To gain the greatest benefits from the power and speed that are inherent advantages of portable tools you must have that type which, because of its particular characteristics, will perform *best* for your operating conditions and methods.

Which type of portable tools — Pneumatic . . . Universal Electric . . . High Frequency Electric — is best for you can be best determined by *competent* study of your particular requirements. **THOR** is especially well qualified to undertake such an assignment because:

**Thor makes all three types of portable power tools.**

**Thor has the engineering "know how" that comes from building good tools for fifty years.**

**Thor is working continuously to make the good tools of today even better tools tomorrow . . . to develop new tools for new applications.**

**Thor has the trained Service Engineers to put this advisory service into practical operation.**

Before you tool up, get this expert, *impartial* advice — and get peak production! For further information, without obligation, write Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Ill.

*Let Thor help you  
get peak production  
with the right type of  
Portable Power Tools*

(Continued from page 130)  
in July, according to the War Production Board, was 28,300. In June, new units shipped numbered 26,600.

Last year the value of machine tools approximated \$771,400,000. This year it may top \$1,400,000,000.

Compared with the same month last year, the July value of machine tools represented an increase of 96 per cent.

Tool builders anxious to continue

their present pace insist that Washington thinks largely in terms of finished goods, sometimes overlooking the fact that it takes machine tools to produce war weapons.

What will happen to the expanded facilities of machine tool makers? Some of them are beginning to talk about direct or big sub-contract war production jobs. Watch for more such talk.

Despite government effort, many machines still stand idle in plants closed

by material diversion. Supplementing WPB work, the Package Machinery Company, Springfield, Mass., is offering to put "millions of machine hours" back into production. George E. Mohlman, president of the company, several months ago announced his concern would act as a clearing house for the exchange of information on machinery needs among his clients. Results: Numerous sales of machines; others leased for the duration.

Within two weeks after the Higgins Louisiana shipyard project was cancelled, engineers at other hard-pressed yards throughout the nation received lists of vital cranes, machinery, etc. offered for sale. Offers were gobbled up by yards previously unable to secure such equipment necessary to step up production.

### Materials

Though production slowdowns are admittedly resulting from lack of raw materials, actual shortages are not so much the basic cause as improper allocating of these materials. Nonetheless, with production demands rising to unprecedented levels, substitute materials can and will play an important role in war production.

Production men may soon be using a new plastic, made by the Hercules Powder Company, and designed to replace rubber in war products and household articles. Base of the new plastic is ethyl cellulose, manufactured from cotton linters or wood pulp, common salt and alcohol from natural gas or from fermented farm products.

Lacking the resilience of natural rubber it cannot be used for tires or inner tubes. It can be made flameproof, and is flexible at temperatures of 70 degrees below zero. Possible uses: Electrical insulation in motors of high altitude planes, gas masks, hospital sheeting, garden hose, gloves, footwear, raincoats, golf balls — and baby pants.

An aircraft material requirement solution has been offered by imaginative Col. Royal B. Lord, Board of Economic Warfare member and WPB official. Proposal is to use low-carbon steel for cargo and trainer planes. One West Coast aircraft manufacturer also predicts widespread use of this less critical metal for aircraft fabrication.

Sheets of proper size could be rolled in mills now idle; fabrication could be done in refrigerator, stove and auto plants, now idle but experienced in handling the metal. Two hundred steel air freighters a month would require only 20,000 tons of low-carbon steel, Lord says.

(Continued on page 134)



One of numerous cartridge clips produced complete per stroke on Dieing Machines, the above is for caliber .303 rifle turned out at record-breaking high production.



Machine gun belt link produced complete one per stroke to extreme precision limits at exceptionally high speed.



INCLUDING BROACHING

Airplane fuselage hinge of duralumin produced complete per stroke on the Dieing Machine in continuous strip to high precision limits.



Airplane strut seat of .031" brass produced complete one per stroke at new high rate.

## We offer experienced counsel regarding Munitions stampings

For several years before Pearl Harbor, the unique Dieing Machine was turning out munitions stampings at record-breaking rates. Today they are called upon to produce the vast majority of machine gun belt links, as well as a wide and growing variety of parts and operations vital to the war effort. Replacing 5 to 10 conventional presses, the Dieing Machine produces the most intricate parts, complete per stroke, to precision of .0002" when required, at speeds up to 600 s. p. m., with capacities from 10 tons to 300 tons. Counsel based upon our wide experience is yours for the asking; cheerfully and promptly!

Request Catalog 42

### COMPLETE PER STROKE . . . INTRICATE STAMPINGS AND ASSEMBLY OPERATIONS

#### STAMPINGS

Mechanical time and contact fuse parts  
Rifle components  
Cartridge clips, or rifle chargers  
Gas mask stampings  
Ammunition stampings  
Bomb components  
Shell parts  
Detonator stampings  
Airplane instrument engine and fuselage parts

#### OPERATIONS

Bullet assembling  
Primer inserting  
Automatic time and contact fuse assemblies

THE HENRY & WRIGHT MFG. CO.

445 WINDSOR ST.  
HARTFORD, CONN.

# HENRY & WRIGHT DIEING MACHINES

# Water Seeks its Own Level

... and so do  
**CARBIDE PRICES!**

PRICE  
\$7.00

You get what you pay for—in carbides as well as any other industrial product made under close technical control. When Tungsten Carbides were introduced, most manufacturers were on an equal footing from the standpoint of experience, methods and costs. As time went on, however, differences inevitably developed in skill, quality and—recently—price.

Most carbide manufacturers have been making the material for little more than a dozen years. We've been doing it for over twenty-five. And today we use all the knowledge and skill of a quarter-century to turn out only the best Carbides it is possible to produce. Many of America's best known concerns—our good customers—are convinced that **TECO CARBIDE TOOLS** hold their cutting edges longer, cut at higher speeds and produce more pieces between grinds.

**TECO** policy will continue to be "Quality first—then price."  
**TECO CARBIDE TIPS** FOR IMMEDIATE SHIPMENT. Standard grades, styles and sizes.

## TUNGSTEN ELECTRIC CORPORATION

570 39th STREET . . . UNION CITY, NEW JERSEY

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio  
Representative: Architects and Builders Building, Indianapolis, Ind.



Pioneers in Tungsten Carbides  
for over a  
Quarter Century

(Continued from page 132)

Argument is presented that the stuff welds easily, wing sections can be pressed into shape like automobile fenders, internal construction will be simpler, weight of planes will be little more than those made from duralumin.

Backbone of the steel industry this winter will be stocks of iron ore at furnaces and Lake Erie docks. Such vital stocks on August 1, totaled 37,326,533 gross tons, highest for the date. A year ago stocks stood at 31,597,386 tons. At

current consumption, these supplies are sufficient for more than five months operation of the steel industry. Furnaces in blast continued at the peak of 181 of an available 190, against 176 out of 186 a year ago.

#### Production

Much has been written to convince the public that continual changes in ordnance design has materially slowed over-all production. Competent surveys prove such stories half-truths. Admittedly, few major production jobs

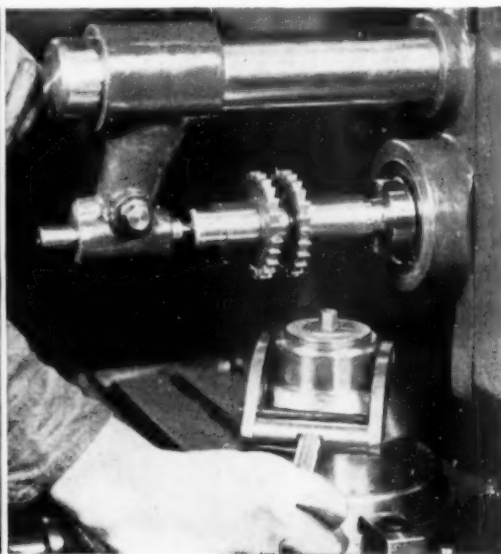
have not undergone many changes in design since production was started—changes occasioned by ever-changing requirements of the armed forces in action.

Best example to refute stories of lost production in model changeover is the medium tank, where improvements have been worked into the volume production technic without materially halting output. In the case of the welded and cast M-4 tank produced at the auto-plant-managed Detroit Tank Arsenal, a long line of them immediately followed the last riveted M-3 off the line. Actually, the final M-3 pulled the first M-4 into position for installation of its full-revolving turret.

## The ZAGAR COLLET INDEX

### FIXTURE

*Speeds up Holding and Indexing*



The Zagar Collet Index Fixture can be used on any standard milling machine to mill slots, hexes, keyways, punches, and taps and to perform many other operations.

#### FOR MILLING, DRILLING, TAPPING, GRINDING, AND SLOTTING

● The Zagar Collet Index Fixture can be adapted to practically any type of collet. It makes hexes, squares, slots, keyways, holes, et cetera. Two types—for holding and indexing or for holding only, each in 1" and 2" capacities. One handle opens, closes, and indexes. You can get any index division from 2 to 25. No chip trouble, since the oil comes up through the collet to lubricate and clean out. Easy to set up; extremely simple in design.

Ask for our descriptive Bulletin "E"



**ZAGAR TOOL, INC.**  
23880 Lakeland Blvd. Cleveland, Ohio

#### Production Ideas

Supplementing the employee suggestion box plan (see page 73), a program for assisting workers in testing their production-wise ideas has been developed at the Walter J. Kidde & Company plant, Bloomfield, N. J. Results obtained by this maker of fire extinguisher apparatus recommend the program to every production engineer.

Educational aspects of the plan include instruction of foremen in assisting workers to express their ideas in mechanical terms, watching for work simplification ideas, giving the man at the bench full credit for his developments.

Most ingenious part of the plan is a simplified tool room, equipped with hand and power tools, where a skilled mechanic assists employees to develop and put their ideas into actual use.

#### Manpower

The need for more "Greenies" in industry (see editorial page 63) was highlighted recently by news from Seattle that a call for women willing to fill 25,000 jobs in nearby shipyards and aircraft plants brought applications from four times that number.

News from the northwest reflected a situation prevailing in other war production centers. Women already living in each area must be selected because outsiders cannot be brought in on account of inadequate housing and limited transport facilities.

Hourly and weekly wages in manufacturing industries rose in June to sur-

(Continued on page 136)

★ ★ ★ ★ ★ ★ ★ ★ ★ ★  
**FOR PRECISION  
WAR PRODUCTION**  
★ ★ ★ ★ ★  
**PLUS**

*Speed* . . USE THE  
*U.S. Multi Miller*

FOR CAM-CONTROLLED INDEX MILLING, GRINDING, VERTICAL MILLING, SPUR GEAR CUTTING, HAND MILLING, AUTOMATIC CUT OFF, CONTINUOUS MILLING OF BAR AND COIL STOCK, ROTARY MILLING, CONTOUR MILLING, CLIMB MILLING, BLIND MILLING AS DESCRIBED IN BULLETIN 60T.



*U.S. Tool Company, Inc.*  
*Ampere, (East Orange), N. J.*



(Continued from page 134)

pass all previous records. This was true not only in cash, but in goods these earnings would buy. The June level was five per cent higher than a year ago, 42.4 per cent higher than 1929. Average cash received per worker: \$39.53.

As regards girls in bomber jobs, two

points of view came to light. A dispatch out of Seattle quoted Boeing's vice president H. O. West to the effect that some women were doing fine work but a great many are in the factory "for other than serious purposes." They are, according to the official, "youngsters in search of a good time. We intend to put most of them into subassembly work,

separating them from men in the shops."

From the other side of the nation, in Baltimore, a Glenn L. Martin spokesman said that the majority of women in our plant feel that they are contributing to the nation's war effort . . . There is less absenteeism among the women than among the men.

## "PRODUCTION DENSITY" AT BOEING

Boeing Aircraft Company, of Seattle, is the first manufacturer in the aeronautical field to be awarded the joint Army-Navy "E" for excellence in production. Since Pearl Harbor, the company has been making the most of "production density", an efficient technique which saves factory space and avoids bottlenecks.

The system has enabled Boeing to proceed far ahead of schedule with its "Flying Fortress" — the giant four-motored B-17. Flexibility of the method is such that during the recent change-over from the B-17-E to the B-17-F, the first of the new models was flown on a test hop within a day after the final "E" model was delivered to the Army Air Corps. More than 400 design changes were involved.

Boeing is said now to have cut the number of man-hours per plane as much as 60 per cent as compared with two years ago. Heretofore in the aircraft industry it has been general practice to assemble ships into final shape at the earliest possible moment, leaving a vast number of complex installations to be handled on a final assembly line. The ship "got big too fast" and appeared like a bee-hive as workers swarmed over it.

The layout at Boeing virtually eliminated the final assembly line. Instead, production is divided up into units which are assembled as completely as possible and then mated together. The major assemblies (there are seven) come together at a final assembly fixture; wires and tubes are connected when the sections are joined. Two positions are provided for final inspection.

The length of travel of raw materials through to finished Flying Fortresses is said to be considerably shorter than in any other comparable plant. Tool Engineers share the credit, too, for many developments such as multiple action presses with which exhaust outlet cowl-ing can be made in 15 seconds, as compared with 30 minutes required formerly with drop hammers. Typical of new tools designed to facilitate output is the "octopus", an appropriate name for a machine in which numerous punches are actuated by a myriad of hose lines connected to hydraulic pumps. Engineers call it a circumferential hydro-punch. It is used to make numerous slots required in the circumferential stiffeners for the fuselage, and it turns out 45 times as much work as the device which it has replaced.

Birthplace of "Density Production," Boeing Aircraft, Seattle.

Official photo, U. S. ARMY SIGNAL CORPS



At Willow Run there was a decrease, for a while at least, in the proportion of newly-hired women. The ratio stood at about one to 11. Certain production men close to the picture reported that the feminine contingent had found some jobs too strenuous, and were troubled by the noise of such jobs as riveting. Attempts were being made to find more suitable classifications for these workers in slacks.

### Awards

Like distinguished service in the field of battle, outstanding work on the production front is rewarded by the Army and Navy. Among recent Army-Navy Award recipients for such work:

The Gilbert & Barker Company, West Springfield, Mass., in ceremonies August 21, at its plant.

The Landis Tool Company, August 21, at their plant at Waynesboro, Penn.

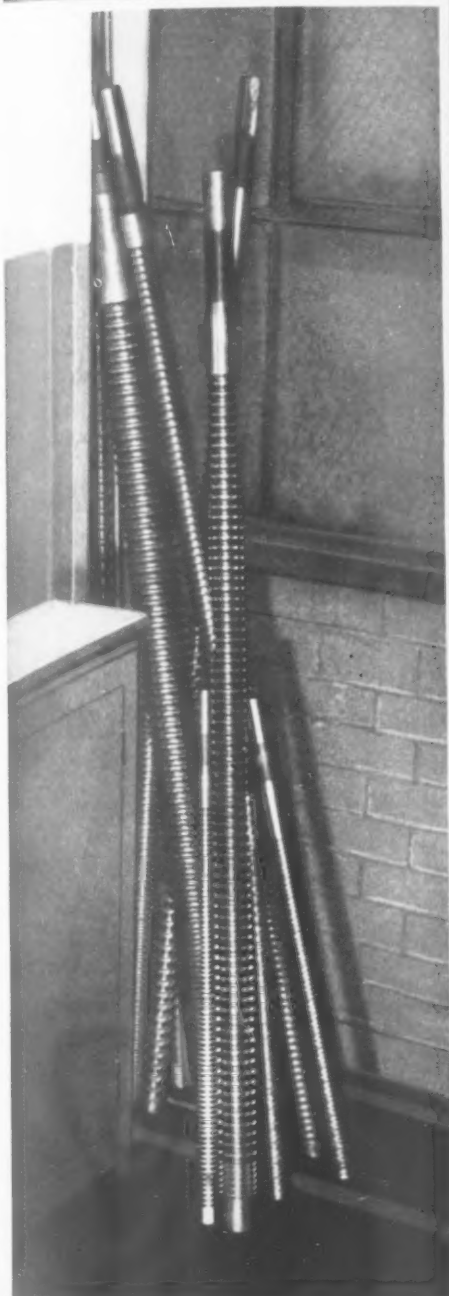
The Greenfield Tap & Die Corp., at Greenfield, Mass., August 19. President Donald G. Millar received the award, assisted by Thomas Colling and Patrick Sullivan, employed by the concern 55 and 53 years respectively.

On September 2, four Detroit machine tool builders received the same recognition: Ex-Cell-O Corp.; Micro-matic Hone Corp.; National Twist Drill & Tool Co.; and Putnam Tool Co.

A Minute Man Flag was raised last month over the Colonial Broach Co. plant in the motor capital. Flag was reward for subscription for war bonds by 98 per cent of Colonial employees. Subscription totals 11 per cent of the payroll.

At the top of a list of 1,300 outstanding war production plants, some employing 60,000 workers, went the name a two-man shop at Bay City, Mich. Donald Nelson thought Jake Sparling, 60 years old, and his 19-year-old helper, Percy Fogelsonger, who have worked 15 hours a day, seven days a week deserved recognition. Their accomplishment: 1,000 heavy flanges machined each month for 18 months.

THE QUICKEST WAY  
TO SPOIL GOOD  
BROACHES . . .



. . . Lean them against  
each other in a corner

*How to get more production  
with your Broaches-----*

## 1. BY PROPER HANDLING

**I**T TAKES time to recondition a damaged broach. Careless handling of your broaches may tie up production. Here are a few good rules to follow to protect these vital war tools:

(a) Always provide individual storage racks for broaches. These should either be of a material that will protect the teeth from damage or else should be lined with such material. If cutting edges of broaches are allowed to strike against each other they may be chipped or nicked.

(b) Never drop a broach on any hardened surface. Broaches are usually made of high speed steel and may even be tipped with tungsten carbide. You may chip, nick, or even break the teeth.

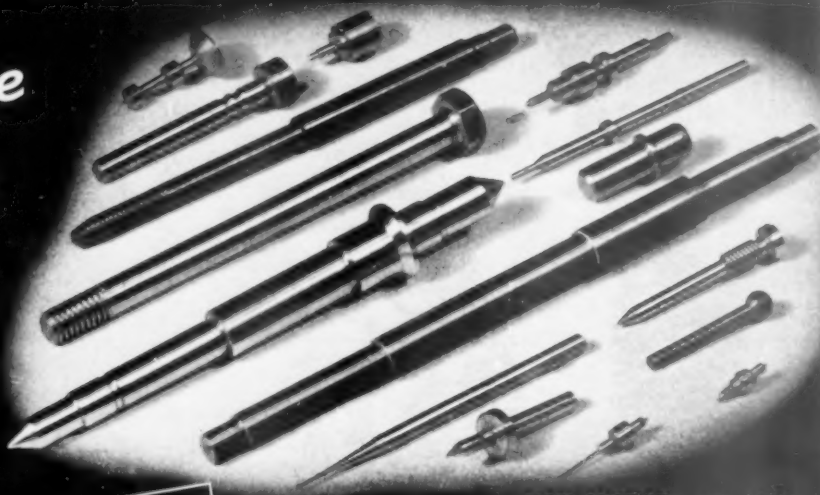
(c) When broaches are to be stored for any period of time they should be treated to protect them against corrosion.

(d) Equipment for moving broaches from one department to another should have separate compartments to prevent nicking of broach teeth.

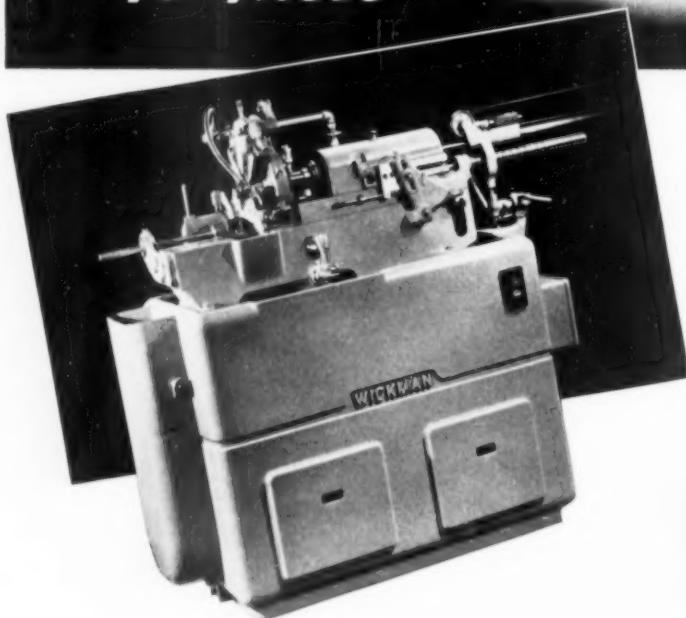
COLONIAL broaches are designed to enable you to machine your parts more accurately, quicker, and at a lower tool cost per piece than with virtually any other method of stock removal. Give them a chance to do an all-out job for you. Handle them carefully.

**colonial** BROACH COMPANY  
*Broaching Machines*  *Broaches-Broaching Equipment*  
DETROIT . . . . U. S. A.

*If You Are  
Producing  
Parts  
Similar  
To These*

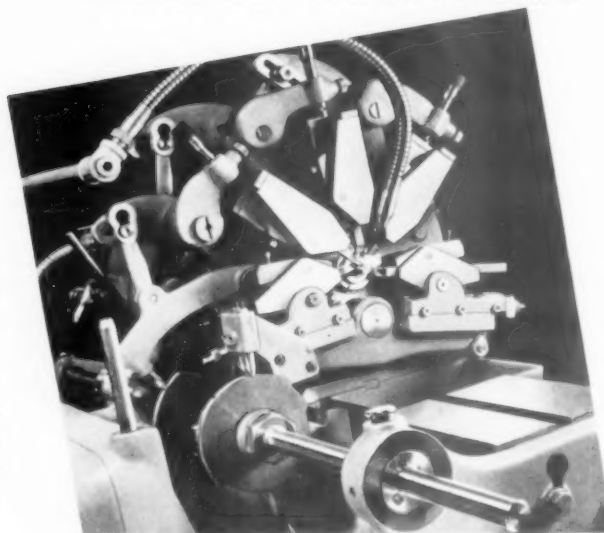


PARTS ILLUSTRATED ARE ACTUAL SIZE  
AND ARE PRODUCED IN ONE OPERATION



**This Machine Can Give You**

- UNEQUALLED ACCURACY •
- FINISH • CONCENTRICITY
- MAXIMUM PRODUCTION



The Wickman High Precision Automatic is a precision built machine designed especially for the production of small, accurately-finished parts from bar stock on a high production basis.

Its principal features are the sliding headstock, work guide bushing, and the rigid tool head carrying five individually-fed tools. The bar stock is fed through the guide bushing to the tools by the sliding headstock and all movements of the headstock and tools are controlled by cams. All tool holders are provided individually with both radial and lateral micrometer adjustments.

Single point tools are employed and, because of the unique design of the machine, there is almost no limitation to the scope of the back shoulder work which can be done, thereby eliminating any need for second operations.

#### SPECIFICATIONS

for No. 2 High Precision Automatic Illustrated

$\frac{1}{2}$ " Collet Capacity • 4" Maximum Turning Length

28 Spindle Speeds up to 7000 R.P.M.

*Full Details Will Be Sent You Immediately Upon Request*

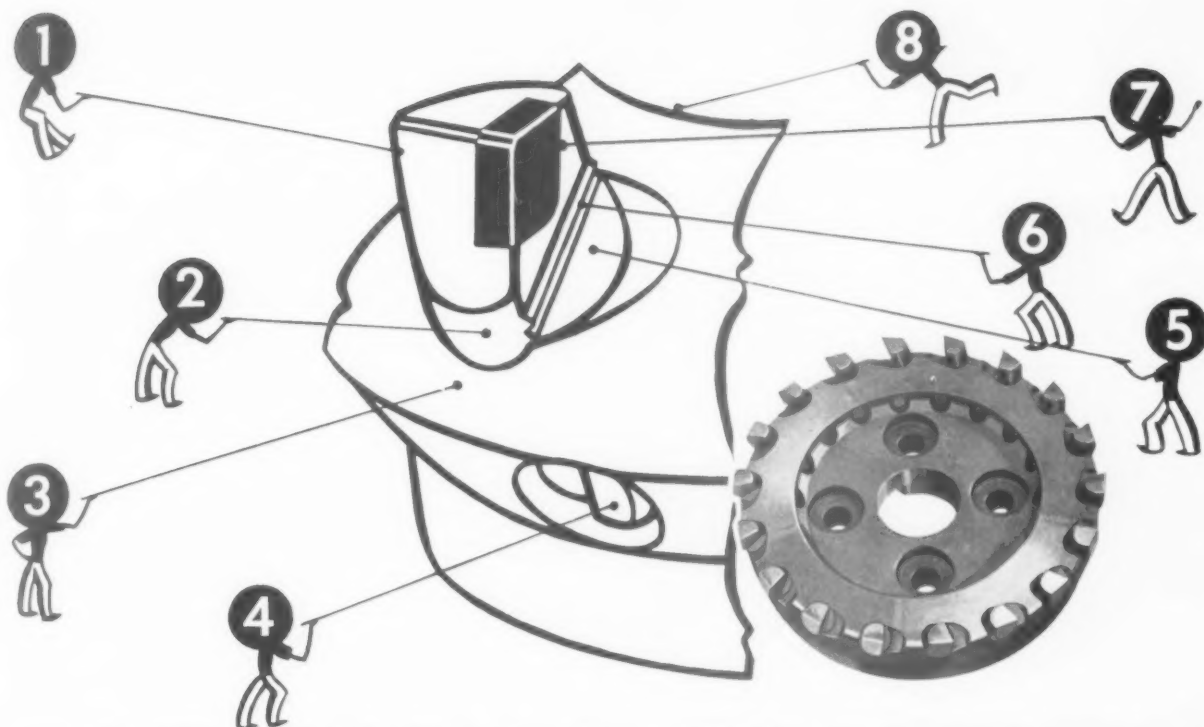
## WICKMAN HIGH PRECISION AUTOMATIC

(SWISS TYPE)

**THE Wickman  
CORPORATION**

15535 WOODROW WILSON AVE.

DETROIT, MICHIGAN



# FEATURING FEATURES

## OF LOVEJOY MILLING CUTTERS

Lovejoy inserted-tooth Milling Cutters have features that put them in a class with solid mills regarding strength and rigidity — and in a class by themselves regarding convenience, production and economy.

- 1 Rugged support for cutting edge of blade — whether it is solid High Speed Steel, Stellite, Rex-alloy or Tungsten Carbide
- 2 Round hole in housing eliminates tendency to fracture under coarse feeds at high speeds.
- 3 Tough forged steel housing.
- 4 Positive locking device for blade makes it impossible for blade to loosen even under severest cutting conditions.

- 5 Finely serrated blade and shoe guarantees minimum metal removed from blade for resharpener.
- 6 Serrations are on the front of the blade — not on the back, or locating side.
- 7 Lovejoy blades are interchangeable over a wide range of sizes. High Speed Steel, Cemented-Carbide, Stellite, and Rexalloy blades are carried in stock for immediate shipment.
- 8 Bores are precision ground concentric with the face of the cutter.

There is a complete line of Lovejoy positive-locking Milling Cutters to meet every requirement — details and specifications will be found in the Lovejoy Catalog. Send the coupon today!

Please mail me the 24-page Lovejoy catalog covering the full line of Lovejoy Mills.

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 COMPANY.....  
 STREET.....  
 CITY.....STATE.....  
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**LOVEJOY TOOL COMPANY, Inc.**  
 SPRINGFIELD, VERMONT, U. S. A.



## WASHINGTON LETTER

By A. N. WECKSLER

Washington Correspondent for  
THE TOOL ENGINEER

**Military services criticize WPB for loopholes through which materials have been diverted to "unauthorized uses."**



Current outlook in war production is complicated by two considerations. Flaws in the system of distributing materials are being highlighted by the shutting down of war plants due to shortages. At the same time, the military services have severely criticized the War Production Board for loopholes through which materials have been diverted to "unauthorized" uses.

Nevertheless, the pattern of controls appears pretty well set. WPB priorities officials insist that the Production Requirements Plan will be made to work. The new "Production Code", which is a revision of the Allocations Classification, will remain in an undetermined status for some time, but at a future date some functional role may be assigned this code.

### Alternate Control Plans

Several experiments are being conducted in alternate control plans, in the event that PRP is not fully satisfactory. An example is the Contract Requirements Plan, an adaptation of the British system under which warrants are assigned a producer to obtain delivery of materials on the basis of fulfilling a specific contract.

It is indicated that shutdowns of plants due to shortage of materials will increase. Plants which are most efficient producers will be favored in allo-

cation of scarce materials. Plants producing component parts of a combat item will be shut down if their output is ahead of schedule.

The full impact of the war economy will shortly begin to become apparent.

### Subcontracting

Efforts to stimulate subcontracting will continue, and plants able to obtain war contracts will have ready access to Government loans for financing, but no large scale subcontracting to newly converted plants seems likely.

The Smaller War Plants Corporation, which has a \$150,000,000 fund to aid conversion and help smaller plants to obtain war contracts, does not appear to have made much progress in its program, and question has been raised as to whether it will be possible to aid large scale conversion to war work.

Emphasis now has been shifted from "conversion" of industry to concentration of production.

### To Follow British Pattern

WPB Chairman Donald Nelson has approved concentration as a matter of WPB policy. Pattern which will be followed is that of British experience. The British concentrated industry to conserve labor, plant facilities, tools and transportation.

In principle, concentration recognizes

that an industry cannot produce on an economic basis at a small percentage of normal capacity output.

British experience was to designate certain nucleus plants, concentrate production in these plants, and actually shut down and convert the remaining plants of the industry.

### Concentration of Industry

The industry itself was permitted to formulate the concentration plan. Industries which were concentrated in Britain are:

Bedding—bolsters, pillows, mattresses. Bicycles—assemblers and component manufacturers.

Boots and shoes—not those made of rubber, or canvas with rubber soles. Braces.

Carpets and rugs.

Cartons and paper boxes—only concentration arrangements between two or more firms giving a release of labor and space.

China clay.

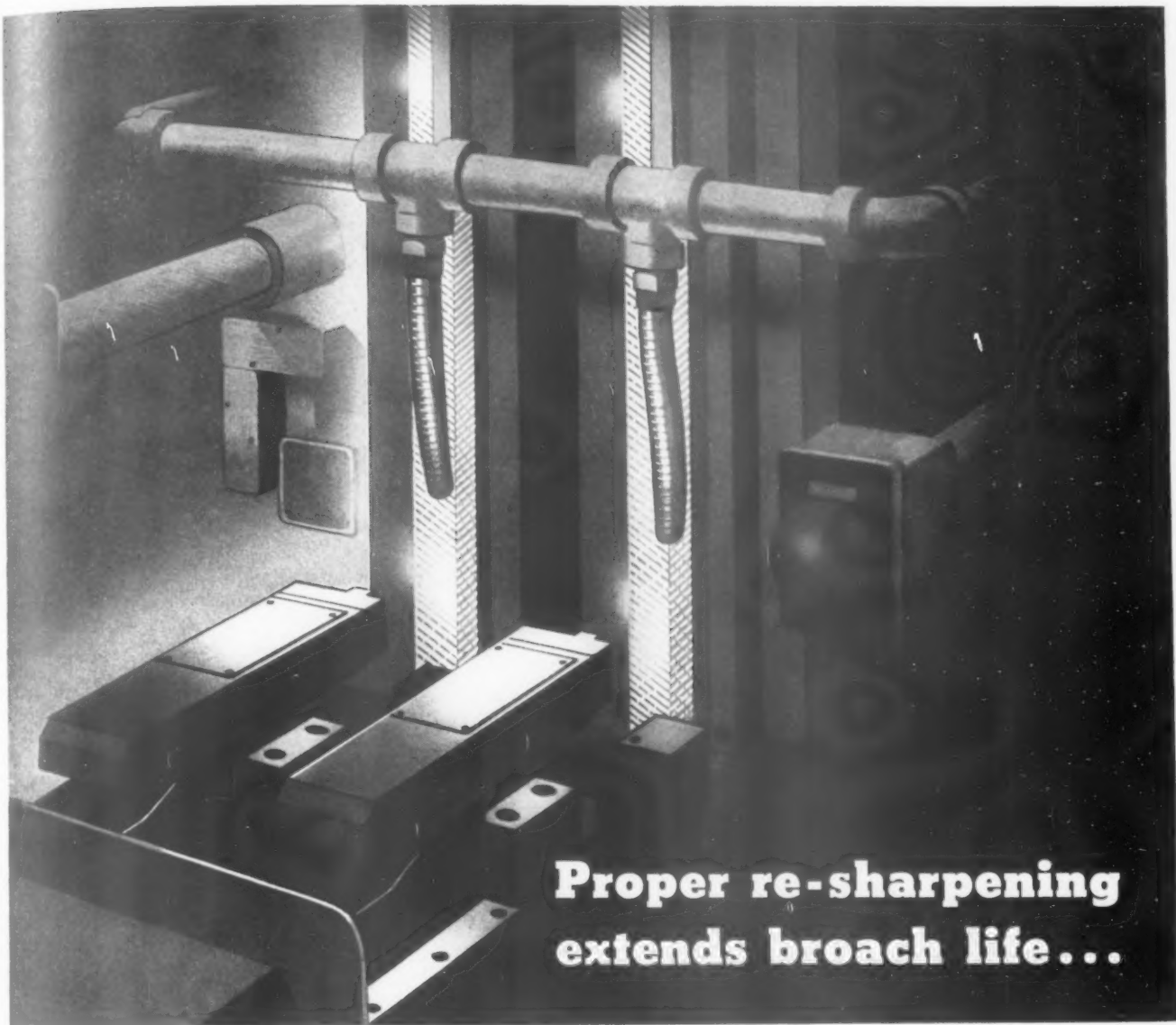
Conduit tubes.

Corsets—including corset belts and brassieres.

Cotton—spinning, weaving (including rayon weaving), waste spinning, doubling, finishing.

Cutlery—knives, spoons, forks, scissors,

(Continued on page 142)



## Proper re-sharpening extends broach life...

*Information supplied by "The Tool Engineer"*

Proper re-sharpening of broaches is a very important factor in their continued performance. Tooth form, cutting hook and finish should conform as closely as possible to the original after re-sharpening.

There are two particular ways of determining when a broach should be re-sharpened. One consists of periodic examination of the finished work. The other, and more accurate, is examination of the broach itself.

If the work starts to show rough surfaces, or tears, it is a good indication that the broach is in need of

re-sharpening. But this method of checking is not recommended.

The best way is to examine the cutting edge of the broach teeth at regular intervals. When there is a shiny land on the tooth, or the edge is ragged, the broach should be sharpened.

The land should not be allowed to become too wide, because if it does, too much stock must be removed in re-sharpening. It is much better to re-sharpen oftener and thus extend the life of the broach.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS. MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

**Climax Molybdenum Company**  
**500 Fifth Avenue • New York City**

cut-throat razors, pocket and clasp knives.  
 Fellmongery.  
 Fountain pens.  
 Gas tubes.  
 Glass—Stourbridge type blown glass only.  
 Gloves—All types except woolen and industrial.  
 Hat hoods.  
 Hosiery—Knitwear, underwear, outerwear, fabrics, seamless hose, heavy hose, fully fashioned hose, infants' wear, knitted gloves, knitted goods

(scarves, berets, mufflers, etc.), dyeing and finishing, warp knitting.  
 Iron foundries.  
 Jewelry.  
 Jute—spinning, weaving, finishing, dyeing, sewing.  
 Lace.  
 Leather—1) Light Leather and imitation leather goods.  
 2) Heavy leather—not leather clothing.  
 Linoleum and floor cloth.  
 Musical instruments.  
 Narrow fabrics—articles or manufac-

tures less than 18" in width.  
 Paint and varnish.  
 Paper makers.  
 Pencils—wooden lead pencils, copying pencils, wooden crayons. Not propelling pencils.  
 Photographic apparatus and materials.  
 Pianos—including piano actions; not organs.  
 Pottery—earthenware, specialty pottery; not stoneware.  
 Rayon—viscose, cuprammonium, acetate.  
 Razor blades.  
 Re-rolling section of iron and steel industry.  
 Rubber.  
 Saddlery and harness.  
 Silk—throwsters and weavers.  
 Sports goods.  
 Steel sheets.  
 Tiles—glazed and floor.  
 Toilet preparations—not medical preparations or soap.  
 Toys.  
 Umbrellas.  
 Woodworking—not sawmills or primary conversion plant.  
 Wool.

## Announcing Our "Toolboy"



A Portable Toolcrib for Holding and Shipping Midget Milling Cutters Combining these Unique Features.

- ★ 3 Convenient Sizes
- ★ No Loss in Transit
- ★ Prevents Dulling
- ★ Easy to Handle
- ★ No Unwrapping
- ★ Easy Inventory
- ★ Capacity of Each
- ★ Lid is Receptacle for Dull Cutters
- ★ Strong Construction
- ★ Use Little Storage Space
- ★ No Cut Fingers
- ★ Full Credit Allowed When Returned.

(Customer invoiced \$ .75, \$1.00, or \$1.50 according to size.)

**SEVERANCE TOOL COMPANY**  
 SAGINAW, MICHIGAN

#### BRANCHES

Long Island City, N. Y. Los Angeles, Calif.  
 Detroit, Mich.

### War Economy

In many instances, U.S. concentration of production will necessitate similar steps to those taken in Britain. Labor and transportation will be an important factor, with freeing of plant facilities and conversion to war work playing a lesser role.

Discussion centers about the role of the WPB when the nation's economy becomes squeezed down to a strictly war economy.

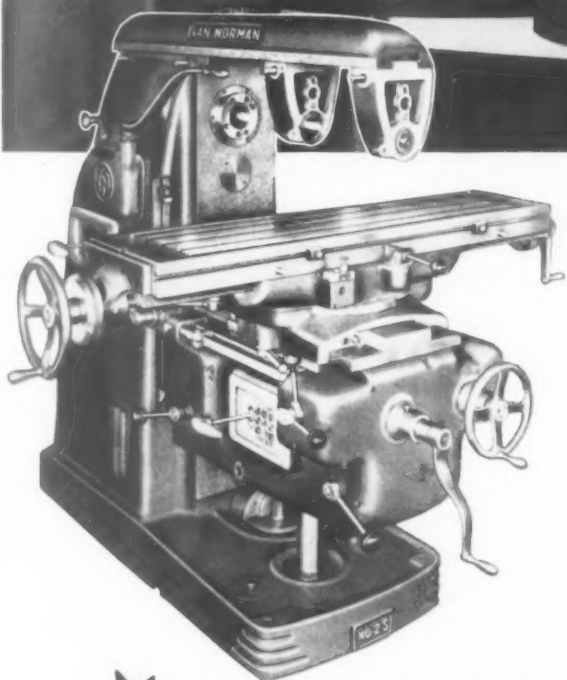
There now remains but one major Governmental function in accomplishing a war economy. Essential civilian economy must be placed on a maximum of efficiency basis—that is, a basis on which it interferes least with the production of arms, and not production at low cost.

### Concentration of Production

This WPB officials expect to accomplish through concentration of production. With this accomplished, there appears little to do beyond seeing that a certain minimum tonnage of scarce materials be allocated civilian industries of basic importance—such as transportation, repairs, communications, etc.

As the nation approaches the complete war economy stage, the clashes over authority between the Governmental civilian leaders and the military high command become accentuated. Further shift of power to the armed

(Continued on page 144)



On June 20th, Van Norman was awarded the Army and Navy E, in recognition of the company's war production record.

## *All Power Controls are* **RIGHT AT YOUR FINGERTIPS** on Van Norman Horizontal Millers

Centrally, conveniently grouped together are all the power-controls of Van Norman Horizontal Millers. And their proper use is never confusing to the operator. For whether he is at the front or back of his machine, he has only to move the levers in the direction in which he wishes to travel the table, knee or saddle. And to change to any of the 18 feeds, he has only to move the single lever-selector to the desired feed indicated on the direct-reading dial. This quick ease of operation enables Van Norman's No. 2-S and 3-S Horizontal, No. 26 and 36 Ram type, and No. 3-V Vertical models to establish new horizons of accuracy and output in horizontal milling operations.

# **VAN NORMAN** MACHINE TOOL COMPANY SPRINGFIELD, MASS., U.S.A.

services can be expected if WPB priorities and allocations system is faulty. The fourth quarter operation of industry will be the test. If industry works well under the structure of WPB controls, the WPB will retain materials control.

If there are any major breakdowns in the system, shift of power direct to the military seems inevitable.

Actions of importance to the machine tools industry are:

July 22—Amendment No. 6 to M-21-b restricts warehouse delivery of primary

steel to A-1-a ratings or higher; secondary steel to A-3 or higher, except for items required for repair and maintenance, which are restricted to a definite percentage of the total quarterly quota assigned a warehouse. Effect of the action will be to restrict warehouse sales of primary steel products to direct military and essential civilian, with secondary steel products allowed greater elasticity.

July 23—Iron and Steel Branch of WPB recommended a 98,279,970 ton steel ingot capacity by mid-1943. This

is an almost 10,000,000 ton increase over present rated capacity, and calls for all but 10 percent of the original expansion program projected by SPAB.

July 24—WPB announcement that new electric motors will be released only for the most important war and civilian requirements. Plan is to request producers to undertake a voluntary simplification program covering types and designs of motors, in order to conserve materials, production capacity and manpower.

July 24—Order M-11-b, prohibiting use of zinc in a list of items, places restrictions on the use of zinc by die-casters. Order applies to metallic zinc, both new and scrap, and to zinc dust for Sheradizing.

July 27—Supplementary Order M-21-c broadens the definition of steel plates subject to control, and prohibits warehouses from selling plates on orders bearing less than A-1-k ratings.

July 29—WPB announced that value of new machine tools, presses and other metal working machinery shipped during June was \$122,700,000. Machine tools accounted for 26,600 units, with a total value of \$111,147,000, comparing with 25,700 units shipped in May, with a value of \$107,300,000.

July 30—Interpretation 3 of General Preference Order E-1-b issued to indicate that Priorities Regulation No. 12, which covers the issuance of top ratings, does not affect priorities on delivery of machine tools to Service Purchasers having an urgency standing on the Machine Tools Master Preference List. The top ratings—AAA and AA-1, AA-2, AA-3 and AA-4—would facilitate delivery to a Service Purchaser who did not have an urgency standing, but do not affect deliveries to Service Purchasers who have been assigned urgency standings.

July 31—General Limitation Order L-151 issued prohibiting manufacture of domestic watt-hour meters after September 26. Permitted production until the cut-off date is 2½ percent of total production of any producer during 1941.

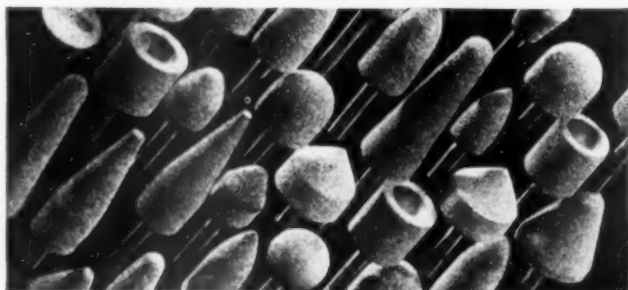
August 3—Order M-38-j, setting aside monthly lead pool for WPB allocation, revoked as a result of current status of lead production which is in excess of demand.

August 7—Amendment to Copper Order M-9-b requires proof from both foundries and ingot makers that they are entitled to receive delivery of refined copper, alloy ingots or copper scrap. Formerly foundries were able to apply their priorities ratings to obtain delivery of ingot from ingot makers.

August 7—Steel Recovery Corporation organized, along lines of Copper

(Continued on page 206)

## POLISH 'EM OFF WITH



### They're TOUGH and DO Their STUFF!

Commandos of the grinding wheel industry — the first small wheels mounted on steelshanks and leading the way today with smoother, more rapid grinding, polishing and finishing of difficult jobs.

Chicago Mounted Wheels — the result of 45 years of KNOW HOW — come in a wide range of styles on different size shanks, for use with any portable or flexible shaft grinder. Several special-formula abrasives give 150% to 300% longer service. More than 200 shapes, all mounted and ready to go.

#### HI-POWER GRINDER

Here's a real production tool — a 3-pounder with enough power to drive a 2½" diameter wheel. 17,000 r.p.m. In case with accessories, \$38.50.

**LATEST CATALOG** Packed full of comprehensive information and pictures. You'll be interested. Send for copy.

**CHICAGO WHEEL & MFG. CO.**  
Makers of Quality Products Since 1896  
1101 W. Monroe St., Dept. TE, Chicago, Ill.

#### TEST WHEEL FREE

If you have a grinding problem, send for a Survey blank, which you'll find easy to fill out. Upon its return, our abrasive engineers will analyze it and send you without charge the trial wheel they recommend for your particular job.

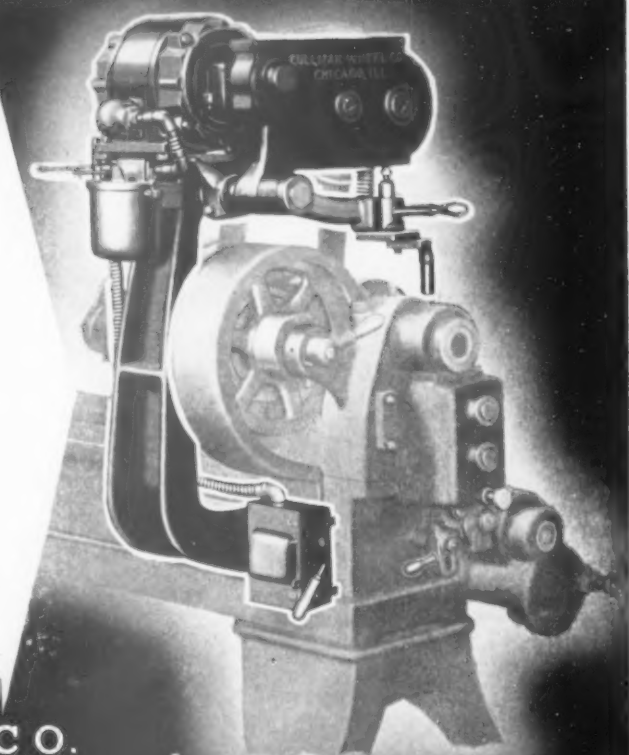
<input type="checkbox"/> Send Hi-Power	<input type="checkbox"/> Catalog	TE-9
<input type="checkbox"/> Free Wheel	Size .....	.....
Name .....		
Address .....		

## TRY A **CULLMAN DRIVE** FOR 60 DAYS —without obligation

Get maximum production from lathe, punch press, shaper, or other shaft driven machine with the modern CULLMAN Motor Drive.

Instant, handy control and belt drive smoothness afford 25% time saving on many operations. The CULLMAN Individual Motor Drive can be installed at a surprisingly low cost. It is made to take motors from  $\frac{1}{4}$  to 15 H. P.

MODERNIZE for greater productivity. Try a CULLMAN Motor Drive in your own plant. Ask for the full facts.



**CULLMAN WHEEL CO.**

1352-R ALTGELD STREET, CHICAGO, ILLINOIS



# 20-25 BEARINGS PER SQUARE INCH!

Many hours of slow and careful hand-scraping by craftsmen on Lombard Surface plates produce this exceptional high degree of precision. Designed for use where extreme surface accuracy is required, these plates are made of high-grade close-grained, semi-steel type iron, especially heat-treated to relieve

casting and machining stress. Every stage of manufacture is under rigidly supervised control. The construction is extra rigid, with heavy ribbing and three point suspension to maintain extreme accuracy indefinitely. Compare, size for size, the weight of Lombard surface plates with others.



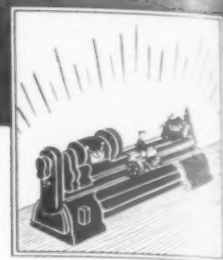
Angle Plates,  
V Blocks, Parallels  
also available.

Twenty standard sizes ranging from 14 x 18" to 48 x 96" available for prompt delivery. Standard Scraped Surface Plates with 12-15 bearings per square inch, Planed Surface and Hand Lapping Plates also available. Write us about any special plate problem you may have.

**WRITE FOR DETAILS AND PRICES**

**LOMBARD GOVERNOR CORPORATION**  
100 MAIN ST. ASHLAND, MASS. U. S. A.

# NEW EQUIPMENT, Materials, Processing



## REBUILT PLANER

(H49)

Because it would have taken nearly a year to get a new planer of the required specifications, a planer was converted by the Simmons Machine Tool Corporation, Albany, N. Y., from 7 feet between housings to 13 feet 6 inches between housings. The illustration shows the old and new bridges.

Needed by an iron works for producing the main engines of heavy cargo vessels, this planer was sent to Simmons where, by providing a new rail and bridge, together with widening blocks between the housings and the bed, it was converted to 13 feet 6 inches. The illustration shows the comparison between the new rail and the old one, which is directly beneath it.

## SADDLE TYPE UNIVERSAL TURRET LATHES

(H50)

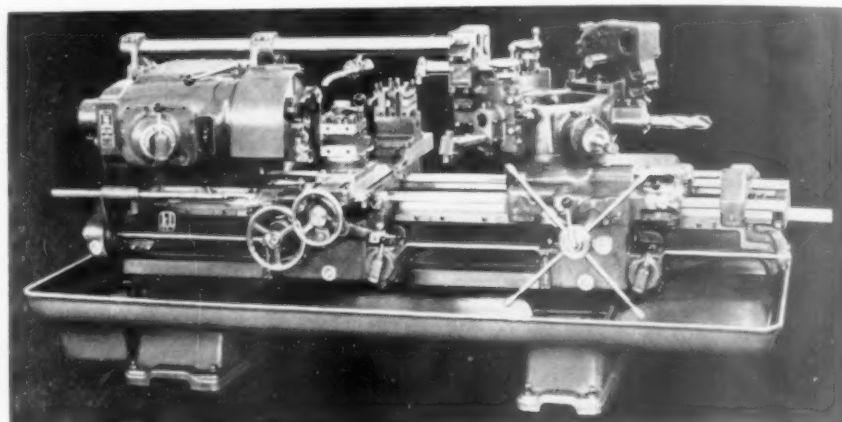
Notable among the features of the new 9A and 10A saddle type universal turret lathes recently announced by Jones & Lamson Machine Company, Springfield, Vermont, is the power traversing of the saddle and the power

indexing of the hexagon turret. Both are operated by one lever through which both high and low positive traversing speeds can be obtained.

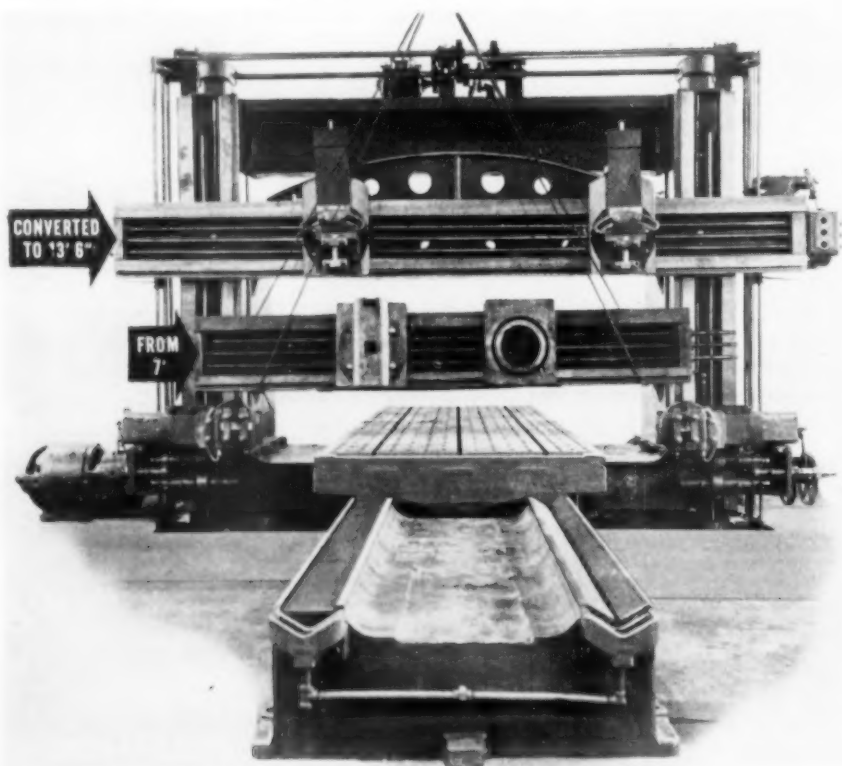
The 9A lathe has a maximum round bar capacity of  $3\frac{1}{2}$  inches and will swing  $23\frac{1}{2}$  inches over the way covers. The 10A lathe has a maximum round bar capacity of 5 inches and will swing

$27\frac{1}{2}$  inches over the way covers. The heavy duty headstock is provided with anti-friction transmission and spindle bearings throughout.

Massive design is said to be an important feature of these lathes. The bed is of an improved double-wall, box-ribbed design, 17 inches across the ways on the 9A and 20 inches on the 10A.



Jones & Lamson's Newest Turret Lathe  
Available in two sizes, both of massive design.



Planer Converted and enlarged by Simmons  
The customer needed it in a hurry.

claimed to give strength and rigid support for both carriage and saddle.

These machines have built-in power rapid traverse for the bridge-type carriage and cross slide. This power rapid traverse has an all-gear drive and is operated by a single lever through which all four movements of the carriage and cross-slide, or a combination of these movements can be made.

## ARMOR PLATE GRINDER

(H51)

The grinder shown set up on a skeleton frame for test purposes is a Vonnegut LG Type Armor Plate Grinder, designed and built by the Vonnegut Moulder Corporation, Indianapolis. When it is installed, its I-beam track rails and grinder unit will be on a concrete foundation.

This grinder bevels straight line edges of armor plate preparatory to arc welding into the shells of armored cars and tanks. It consists essentially of a stationary grinder unit, 45 foot tracks, and twin traveling work tables. To provide for edge bevels of from 90 to 25 degrees, the two work tables are adjusted angularly by means of heavy screws.

It is claimed that almost continuous

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**3** When answering advertisements, specific information on problems or company representative's call.

## HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail. Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described. In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.



**USE THIS CARD** for requesting new catalogs and bulletins listed in this issue.



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<p>Write in square, number of item describing one catalog wanted → <input type="checkbox"/></p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE _____</p> <p>THE TOOL ENGINEER, SEPTEMBER 1942</p>	<p>Write in square, number of item describing one catalog wanted → <input type="checkbox"/></p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE _____</p> <p>THE TOOL ENGINEER, SEPTEMBER 1942</p>
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<p>PAGE NO. _____</p> <p>NAME OF ADVERTISER _____</p> <p><input type="checkbox"/> Literature <input type="checkbox"/> Have Representative Call</p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE _____</p> <p>THE TOOL ENGINEER, SEPTEMBER 1942</p>	<p>PAGE NO. _____</p> <p>NAME OF ADVERTISER _____</p> <p><input type="checkbox"/> Literature <input type="checkbox"/> Have Representative Call</p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE _____</p> <p>THE TOOL ENGINEER, SEPTEMBER 1942</p>
<p>PAGE NO. _____</p> <p>NAME OF ADVERTISER _____</p> <p><input type="checkbox"/> Literature <input type="checkbox"/> Have Representative Call</p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE _____</p> <p>THE TOOL ENGINEER, SEPTEMBER 1942</p>	<p>PAGE NO. _____</p> <p>NAME OF ADVERTISER _____</p> <p><input type="checkbox"/> Literature <input type="checkbox"/> Have Representative Call</p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE _____</p> <p>THE TOOL ENGINEER, SEPTEMBER 1942</p>

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*Request for additional information and catalogs covering*

**NEW EQUIPMENT  
MATERIALS  
PROCESSES**

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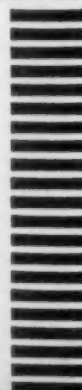
### THE TOOL ENGINEER

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TO CALL**

production is possible because while one table is operated, the other table is being unloaded, loaded, and set up. The tables travel on ball bearing rollers, upon hardened steel tracks. To resist the grinding wheel forces, the upper rollers and tracks are set at proper angles.

Table travel is actuated by a cable drive with choice of 25, 30, or 35 feet

inserted or screwed in far enough and stop the machine if not, so the piece can be reclaimed and re-run.

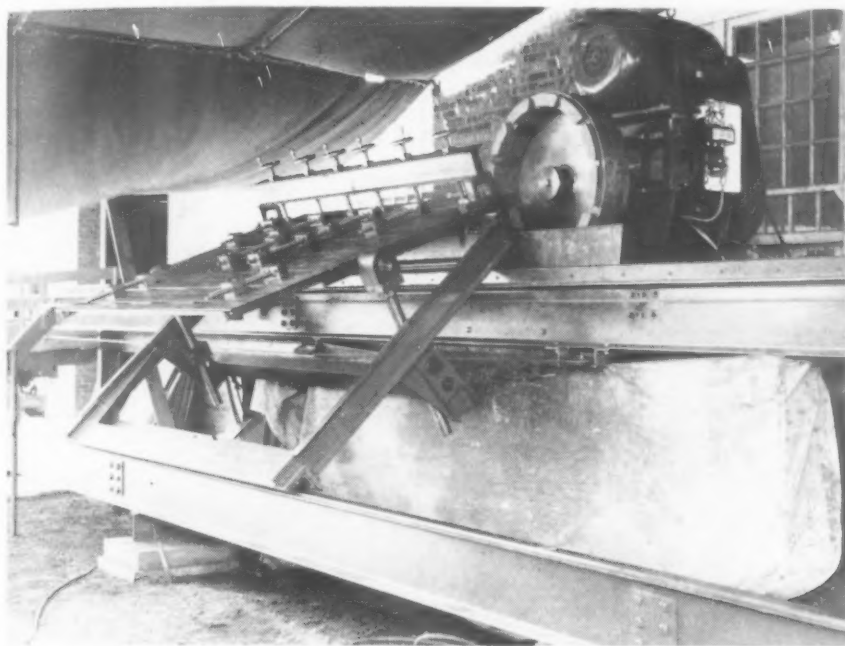
### VERTICAL MILLER

(H53)

Said to be designed especially for rapidly performing vertical milling operations on small parts, this new 1-14V vertical milling machine is be-



**Vertical Miller by Kent-Owens**  
Handles small parts efficiently.



**Armor Plate Grinder, Built by Vonnegut**  
Shown here on temporary mount for experimental purposes.

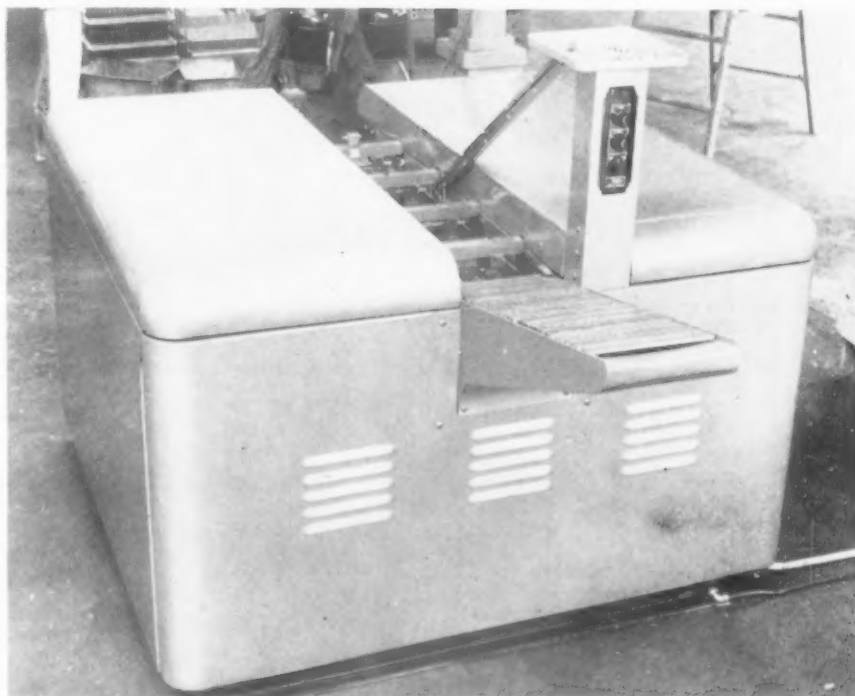
per minute rate of feed. Cutting is provided by a 36-inch diameter abrasive chuck wheel supported on a 6-inch diameter spindle in long tapered, babbitted bearings with ball bearing thrust collar.

### AUTOMATIC MACHINE

(H52)

An automatic machine for making bodies of brass percussion primers which are threaded in both ends has just been announced by the Watcher Design Company, 2421 Bremont Avenue, Cincinnati. It is said to be adaptable to the several lengths up to 10 inches and to other products which can be moved and re-chucked for various operations by any number of spindles.

Cut-to-length tubing is fed into a hopper at the front and the finished part rolls out the back. Both ends of the work are faced, counterbored, reamed, and tapped. For inspection and substitution, the work carriage has extra open stations which allow rapid removal of any piece after any operation. Electric gauges check whether the plug is



**Watcher of Cincinnati Presents an Automatic Machine**  
Performs numerous operations on brass percussion primers.

made possible through the use of graduated dials.

It is claimed that practically any desired cycle can be obtained, such as milling work at one end of the table while unloading and loading the other end, because the table has feed in both directions, rapid traverse in both directions, automatic shift from rapid traverse to feed in either direction, and automatic reverse at both ends of the stroke. Dogs can also be provided for intermittent milling.

### VARIABLE SPEED LATHES

(H54)

Manufactured by the Schauer Machine Company, 2066 Reading Road, Cincinnati, this new speed lathe is for finishing, burring, filing, lapping, or polishing and is designed especially to increase the output of finished screw machined parts up to 1 $\frac{3}{8}$  inches in diameter.

The machine is equipped with a Sjogren Chuck that operates a spring type collet which is adjusted to the size of the work by means of a hand wheel

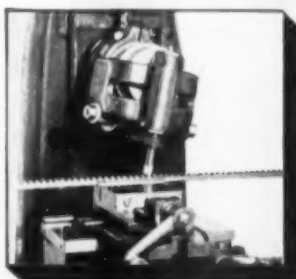
### INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.

mounted on the chuck. Motor speeds are available from 20 rpm to 4000 rpm and are in ratio of 6 to 1 for single speed motors and 12 to 1 for two speed motors.

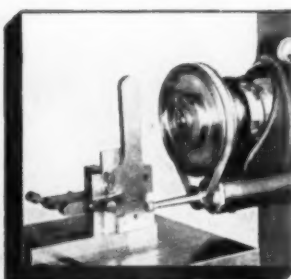
A variable pitch pulley controlled by a ball crank gives the variation in spindle speeds. Connection between driving and driven parts is by means of replaceable, standard length V belts.

## LIBERTY High Speed Grinding Attachments



Grinding clearance of broach teeth.

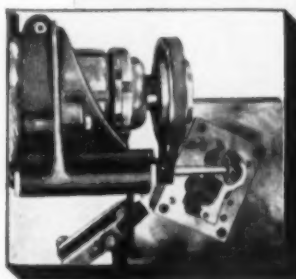
Both horizontal and vertical types are easily attached to most surface grinders for grinding angles, slots, recesses and surfaces which are impossible to reach with large grinding wheels.



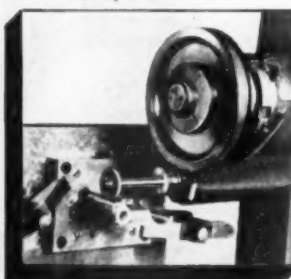
Grinding gage in perfect alignment with other points.

For extremely accurate grinding on gages, tools, dies, etc. Assembled complete with any size bores, pulleys, belts and grinding wheels at no extra cost.

Write for details—specifying diameter of spindle head, type and make of grinder.



Grinding punch form.



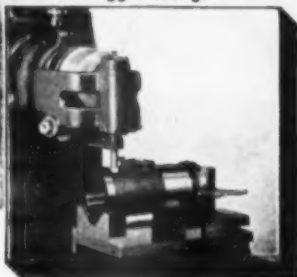
Grinding shoulder on punch.

## LIBERTY TOOL & GAGE WORKS

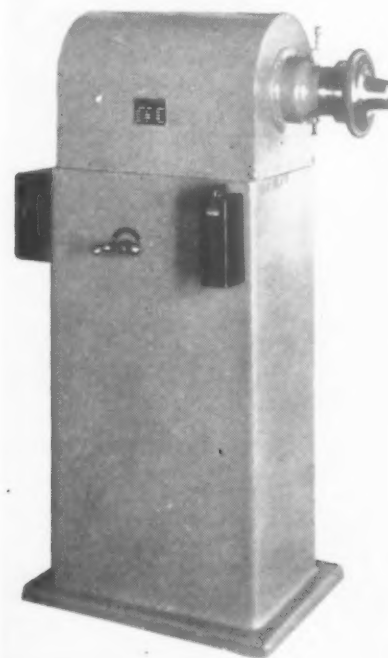
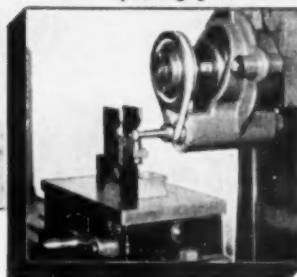
235 Georgia Ave.

Providence, R. I.

Grinding rectangular opening in trigger casing.



Grinding gaging seat on special gage.



Speed Lathe by Schauer  
Motor speeds: 20 to 4000 rpm.

### HYDRAULIC PUMP

(H55)

A recent addition of a 6-plunger, fully enclosed, horizontal, hydraulic pump to the line of the Charles F. Elmes Engineering Works, Chicago, has been announced. All moving parts of this pump, said to embody the latest principles of design and construction, are pressure lubricated and the connecting rods run in a continuous bath of oil. Roller bearings are used throughout the machine.

The maximum capacity of the pump is 400 hp. Herringbone gears are used for driving the pump and are claimed to insure long gear life. To save space, the pump has been compactly arranged. Said to be particularly adaptable for

THE TOOL ENGINEER



International News Photos

Niagara Presses and Shears are helping production men shatter all records.

High production, convenient handling of the work, rugged construction that reduces down time are results of the talent and experience built into Niagara machines.

The complete Niagara line of presses, shears, and sheet metal working equipment provides the most productive and economical machine.

Write for bulletins. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Cleveland, Detroit, New York.

Manufacturers of America's warplanes are using Niagara machines for shearing and forming sheet metal.



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# GEORGE SCHER ENGINEERING CO.

115 FIRST ST.

NEWARK, N. J.

## — NEW EQUIPMENT —

accumulator systems, this pump can be equipped with built-in bypass valves or safety valves.

### VERTICAL TURRET MILL (H56)

Designed for boring, drilling, and turning ferrous and non-ferrous castings and forgings, a new vertical turret mill, called the "Perfect 36" has just been announced by the Rogers Machine Works, Inc., 125 Arthur Street, Buffalo, N. Y.

This machine has a specially designed swivel head and main head that



Elmes Expands Its Line  
New pump has 400 hp. capacity.

## TANNEWITZ HIGH SPEED METAL CUTTING BAND SAWS

... a far Faster  
Means of Cutting

**TEMPLATES**

from SHEET STEEL up to 1/4"

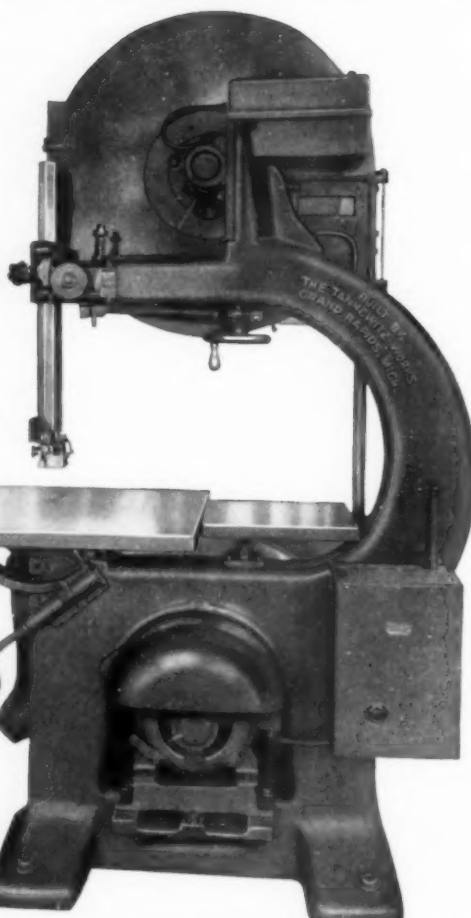
**NON-FERROUS  
MATERIALS**

of all kinds up to 3"  
thick — see chart below

### SAVE THEIR COST IN SHORT ORDER

These superb machines, delivering over two miles of saw blade travel per minute without vibration, are doing hundreds of metal cutting jobs in a fraction of the time previously required, in metal working plants of every description throughout the country. To increase production and make important savings get the details NOW! A line requesting Metal Cutting Band Saw Bulletin will bring them to you promptly.

KIND OF MATERIAL	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"
MILD STEEL	24	12	6	3	1		
STAINLESS STEEL	24	12	6	3	1		
YELLOW BRASS, ZINC	24	12	6	3	1		
BRONZE OR COPPER	24	12	6	3	1		
ALUMINUM	24	12	6	3	1		
INVAR	24	12	6	3	1		
DOUBLE PLYMETAL	24	12	6	3	1		
PLYWOOD	24	12	6	3	1		
ASBESTOS BOARD	24	12	6	3	1		
FIBRE (HARD)	24	12	6	3	1		
PARAFFIN BOARD	24	12	6	3	1		
MASONRY	24	12	6	3	1		
BAKELITE	24	12	6	3	1		



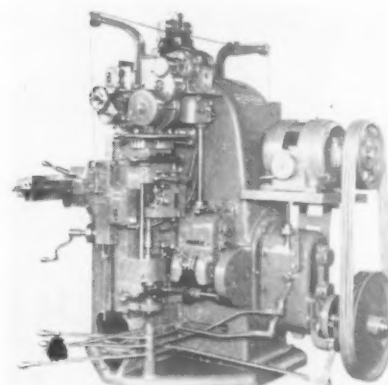
**PERFECTLY SAFE:** Two-wheel Lockheed Hydraulic Brakes automatically and instantly stop the wheels in case of saw blade breakage—completely guarded.

Incorporated in Tannewitz High Speed Band Saws are many highly developed, patented features found in no other band saws.

*Made by Sawing Machinery Specialists*

**THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.**

provide two operations on the work at the same time. Quicker and simpler tool setting for irregular pieces is said to be made possible by incorporating the swivel design in the side head and allowing the side head to be set to any angle up to 35 degrees either way. Time is saved in making set-ups for original and second runs because the machine is furnished with a built-in, graduated dial.



"The Perfect 36"  
New Vertical Turret Mill by Rogers

The capacity of this miller is 36 inches diameter. Table face to turret face is 24 inches maximum. The main head and the side head have 8 vertical and horizontal feeds each. It has a motor-driven, rapid traverse, heavy duty main clutch that runs in an oiltight case.

### INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.

### LEVELING JACKS (H57)

Machine leveling jacks for machine

THE TOOL ENGINEER

# RACINE Variable Volume Pumps for

Use Long Lived RACINE Pumps when you need oil-hydraulic power. Designed to maintain continuous pressures from 50 to 1000 pounds per square inch providing a smooth non-pulsating flow of oil in deliveries of 12, 20, and 30 gallons per minute.



**Controlled Power**—Husky shock absorbing governor automatically protects your equipment from hydraulic hammering by absorbing momentary shock pressures and thus maintaining even pressure control.



**Controlled Hydraulic Power**—Tilted hydraulically balanced vanes polish rather than gouge pressure chamber ring.



**Big Rugged Roller Bearings**—Support the husky shaft, giving that extra strength to stand maximum loads day in and day out.



**Controlled Performance**—The movement of this ring instantly controls the flow of oil, pumping only the exact amount required by the circuit.

Write for catalog P-10-C today on RACINE Variable Volume Pumps and Hydraulic Controls. Our engineers will be glad to work with you on your hydraulic problems.



**RACINE TOOL & MACHINE CO.**  
1777 STATE ST. ... RACINE, WIS.

# NEW--

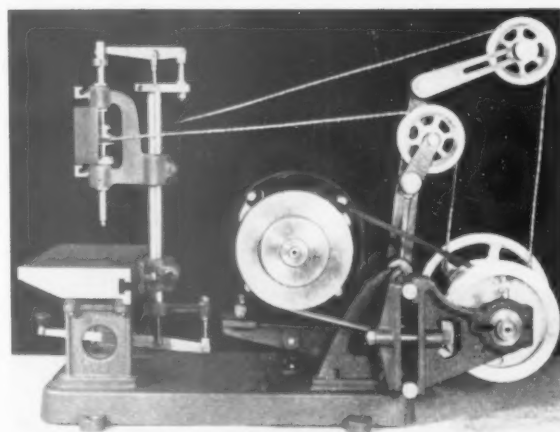
*Super sensitive*

## HIGH SPEED DRILL PRESS -SPEEDS UP TO 23,000 R.P.M

The NEW Lord & Davis Super Sensitive Drill Press offers convenient finger-tip control, precision, balanced construction, and speeds up to 23000 R.P.M. — all vitally important for drilling holes from 1/16" down to .004" (or smaller) in diameter.

The sensitivity is attained by balancing the spindle by means of the vertical component of the belt tension. This accurately transmits the "feel" of even the tiniest drills to the finger-tip control. Drill breakage is thus reduced to a minimum.

Machines with one, two, three, or four spindles are available. Mail the coupon today for details!



Please send me complete details on the Super Sensitive Drill Press.

NAME

TITLE

COMPANY

STREET

CITY

STATE

T. E.

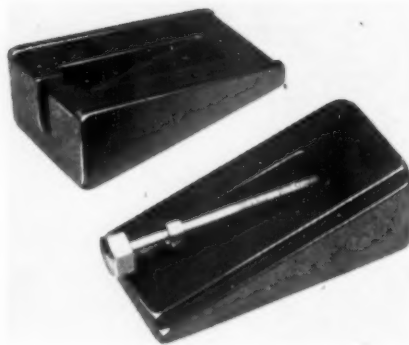
**EDWARD BLAKE COMPANY**  
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

J.B TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS

## —NEW EQUIPMENT—

tools, industrial furnaces, large surface plates, and large assembly fixtures are being manufactured by the Enterprise Machine Parts Corporation, Detroit. These jacks are said to eliminate cement bases and floor bolts since a set of four, six, or eight, depending on the size of the machine, will be ample support for most machines.

The jack consists of two iron castings and a shouldered screw. The screw head bears against the slotted end of the lower casting and a shoulder ring is machined on the screw shank to ride



**Leveling Jack by Enterprise**  
Built to support great weight.

## —NEW EQUIPMENT—

against the inner face of the slotted end. The screw is threaded into the opposite end of the upper casting and turning causes one section to ride over the other. This movement, coupled with the inclined plane principle, raises or lowers the base of the machine placed on the jacks.

## INFORMATION FREE

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4 1/2" Lathe Clutch Gear

IT'S MADE OUT OF  
**SPEED TREAT STEEL**  
A MEDIUM HIGH CARBON OPEN HEARTH PRODUCT

—because . . .

1. Speed Treat increased production 42%
2. Speed Treat reduced scrap 16%
3. Speed Treat reduced costs \$51.50 per ton of steel used
4. Speed Treat replaced shell quality steel

Ductility  
Plus  
Machinability  
(170 SFPM)

In this "all-out" war effort Monarch Steel is co-operating 100%.  
We're helping to "keep 'em rolling" with Speed Treat Steel.

Licensors  
**MONARCH STEEL COMPANY**  
HAMMOND • INDIANAPOLIS • CHICAGO  
PECKOVER'S LTD., Toronto, Canadian Distributor

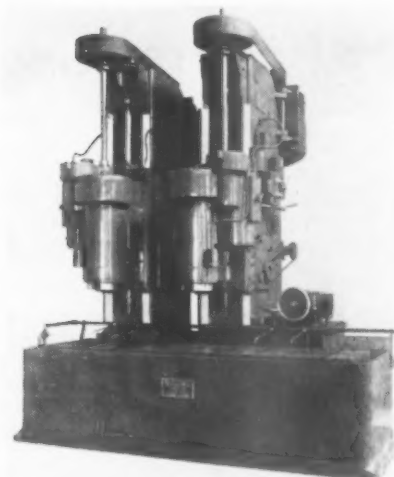
Licenses for Eastern States  
**THE FITZSIMONS COMPANY**  
YOUNGSTOWN, OHIO

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

## ROD BORING MACHINE (H58)

Designed and built by the Moline Tool Company, Moline, Ill., this special, hydraulic feed, two-column vertical machine is for boring Diesel engine connecting rods. The spindle speeds range from a minimum of 5.66 RPM to a maximum of 238 RPM. It has a minimum feed of .125 inches per minute and a maximum feed of 9 inches per minute.

The left-hand column of this machine is stationary and is bolted to the base. The right-hand column is movable and is mounted on a massive slide which moves on a V-guide and a flat way on



**Moline Rod Boring Machine**  
Handles Diesel connecting rods.

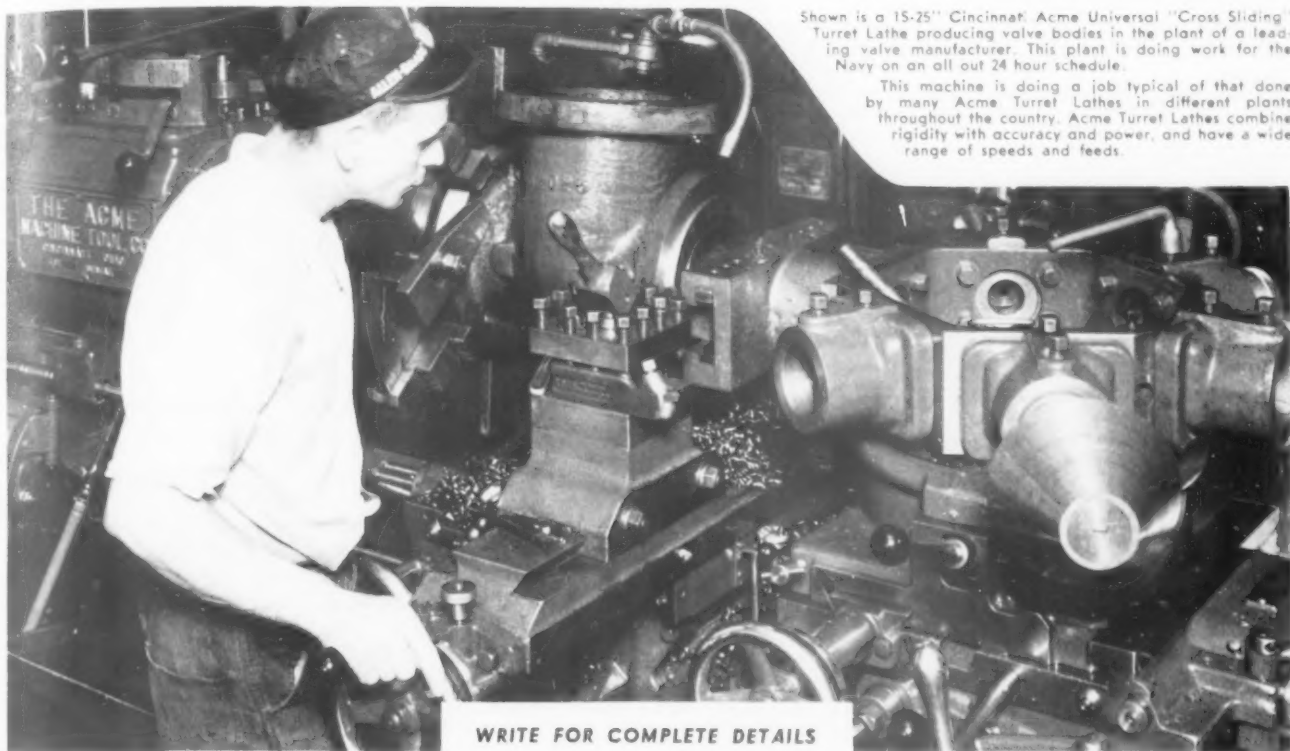
the base. A motor driven worm shaft which actuates a rack and pinion traversing mechanism is the means by which the slide is moved.

To control the traverse motor, push buttons and safety stopping devices are provided. Each of the two spindles is driven by a motor having a 3 to 1 speed range through V-belts to a spline shaft and a quick change gear box.

THE TOOL ENGINEER

CINCINNATI  
**ACME**  
UNIVERSAL  
TURRET LATHES

# ALL OUT PRODUCTION FOR OUR NAVY



Shown is a 15-25" Cincinnati Acme Universal "Cross Sliding" Turret Lathe producing valve bodies in the plant of a leading valve manufacturer. This plant is doing work for the Navy on an all out 24 hour schedule.

This machine is doing a job typical of that done by many Acme Turret Lathes in different plants throughout the country. Acme Turret Lathes combine rigidity with accuracy and power, and have a wide range of speeds and feeds.

WRITE FOR COMPLETE DETAILS

**THE ACME MACHINE TOOL COMPANY, CINCINNATI, OHIO**



## SPEED UP TOOL DELIVERIES WITH STANDARD DRILL FIXTURES

AN LL TYPE FIXTURE TO LOCATE  
AND BORE A LONG HOLE IN AN  
IRREGULAR SHAPED CASTING

STANDARD FIXTURES WITH A  
FEW ADAPTERS WILL SOLVE THE  
MAJORITY OF YOUR DRILLING  
PROBLEMS

ASK FOR CATALOG 941

# SWARTZ TOOL PRODUCTS Co., Inc.

13330 Foley

Detroit, Michigan

Cleveland—J. W. Mull, Jr.  
Indianapolis—J. W. Mull, Jr.  
Milwaukee—Geo. M. Wolff, Inc.  
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Represented by  
Canada—Hi-Speed Tools, Ltd., Galt, Ont.  
St. Louis—Mill Supply & Mach. Co.  
Beverly Hills, Cal.—Criterion Tool Sales  
Houston—Engineering Sales Co.

Oneida, N. Y.—W. F. Himmelsbach  
Pittsburgh—J. W. Mull, Jr.  
Toledo—J. W. Mull, Jr.  
Philadelphia, Pa.—Morgan Tool  
& Equipment Co.

## TOOL HOLDERS

Six new tool holders designed for the accommodation of the Luers patented cutting-off blades on six additional types of screw machines have just been announced by the Empire Tool Company, Detroit. This holder development now broadens the use of Luers blades to include their adaptability on the following makes of machines: Greenlee 4 and 6-spindle automatics, New Britain automatics, all lathe and hand screw machines with round posts, Acme-Gridley R and RA series, and Gridley mod-



Six new tool holders designed for the accommodation of the Luers patented cutting-off blades on six additional types of screw machines.

els F and G multiple spindle automatics.

One of the outstanding features of the holders is said to be the ease, speed, and simplicity with which a cutting-off

tool can be set up in the machine. Two unique cams are said to hold the Luers blade in place as securely and rigidly as any forged blade and force the top surface of the blade against the ground surface of the holder.

## INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.

**ADDED PROTECTION—  
NO EXTRA COST!**

**ALL-PURPOSE  
MOTORS**  
.....  
**TOTALLY-ENCLOSED  
MOTORS**  
.....  
**EXPLOSION-PROOF  
MOTORS**  
.....  
**FLANGED TYPE  
MOTORS**  
.....  
**GEARHEAD  
MOTORS**  
.....  
**SPECIAL TYPES  
BUILT TO  
SPECIFICATIONS**  
.....  
**BUILT-IN  
MOTORS**  
.....  
**LIMA GEARSHIFT  
DRIVES**

**ADDED PROTECTION - AT NO EXTRA COST . . .**  
That's what you get when you buy LIMA Type RS Electric Motors. The Semi-enclosed DRIP-PROOF feature makes the LIMA Type RS outstanding as an all-purpose motor . . . and, there is **NO EXTRA COST** for this protection over the standard open type motor.

The LIMA Type RS is built in sizes from 1/2 to 75 H.P. brake test. Is adaptable to production lines, individually operated machine tools and general manufacturing locations where totally-enclosed motors are not especially needed. The Semi-enclosed DRIP-PROOF feature affords maximum protection against chips and filings, dripping or splashing liquids so destructive to open type motors.

Write or wire today for literature. Prompt attention to all inquiries . . . **PROMPT DELIVERY** on orders.

*Large enough to successfully serve you, yet small enough to give personal attention to your needs.*

**THE LIMA ELECTRIC MOTOR CO.**  
OFFICES - NEW YORK - CHICAGO - DETROIT  
LIMA, O. U. S. A.

DRIP-PROOF  
1 to 75 HP

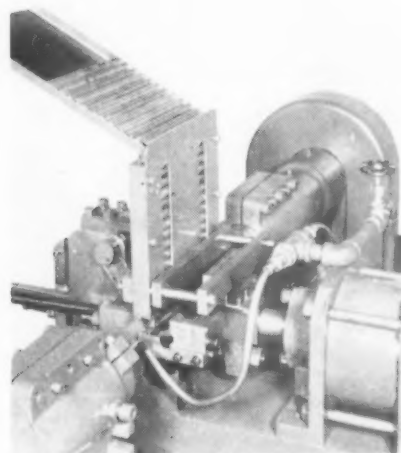
POLISHING LATHES

OPEN

VERTICAL

TOTALLY-ENCLOSED

EXPLOSION-PROOF  
1 to 5 HP



An automatic chute feed for the air chuck on the Pines 2-spindle profiler.

## CHUTE FEED FOR PROFILING MACHINE

The addition of an automatic chute feed to the air chuck on the Pines 2-spindle profiling machine has just been announced by the Pines Engineering Company, Inc., Aurora, Ill. This attachment is being used to feed such items as brass and copper primer tubes for boring and tapping operations on both ends at the same time. The addition of this automatic feed is said by the manufacturer to increase production of these machines as much as 30 percent.

These profilers are being used for burring, chamfering, facing, threading, centering, reaming, and boring both ends of tubes or rods simultaneously. It is said that several of these profiling

**BRAEBURN ALLOY  
STEEL CORPORATION**  
(Pittsburgh District)  
BRAEBURN, PA.

**COMO**

**MOLY-COBALT  
HIGH SPEED  
STEEL**

### Chemical Analysis

Carbon .77	Chromium 4.00	Tungsten 1.55	Vanadium 1.00	Molybdenum 8.00	Cobalt 5.00
---------------	------------------	------------------	------------------	--------------------	----------------

### Heating Instructions

Forging	(Brinell 228-241)	1800° F. 1950° F.
Annealing		1600° F.
Hardening		1450° F. 1500° F.
Preheat	(Quench in oil or air)	2225° F. 2250° F.
High Heat		1050° F. 1100° F.
Draw		

### Hardness Data

Draw ° F.	2250° F. Oil
As Quenched	C-65 to 66
1050° F.	C-64 to 65
1100° F.	C-61 to 62
1150° F.	C-58 to 60
1200° F.	C-51 to 52

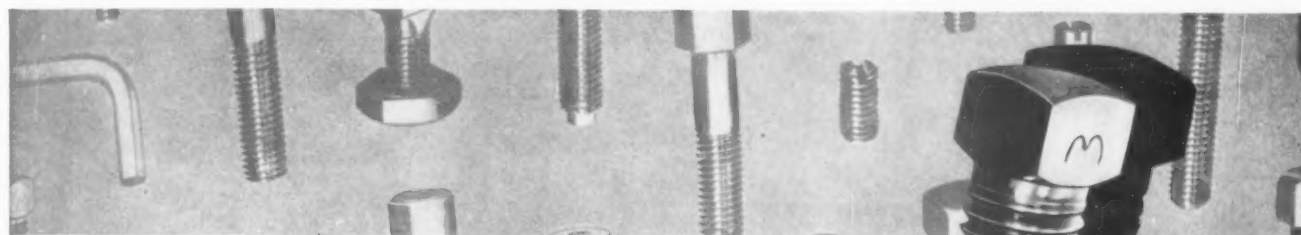
### Applications

HEAVY DUTY LATHE, PLANER  
AND BORING TOOLS, TOOLS FOR  
CUTTING CAST IRON AND STEEL,  
TOOLS FOR CUTTING HEAT  
TREATED FORGINGS.

**WRITE FOR LITERATURE**

**BRAEBURN ALLOY STEEL CORP.**

**BRAEBURN, PA.**



### MAC-IT Square Head Set Screws For Jobs Requiring Extraordinary Strength

Mac-it quality square head set screws are made for the toughest kind of holding-down jobs—forming machine bearings, giant axle housings, die clamps, cutting tools, forging machinery, and the like.

Mac-it square head set screws obliged to endure terrific punishment show unusual resistance to upsetting or mushrooming of the points and to breaking off under the heads.

#### OTHER MAC-IT PRODUCTS INCLUDE:

Socket Head Cap Screws • Hexagon Head Cap Screws • Hollow Set Screws •  
Stripper Bolts • Hexagon Socket Pipe Plugs



**THE STRONG, CARLISLE & HAMMOND COMPANY**  
**1392 West Third St., Cleveland • Ohio**

operations can be combined and performed at the same time.

### DIAMOND TOOL FOR SHOT FORMS (H61)

Developed for use on shot, shell, and projectile forms by the Wheel Truing Tool Company of Detroit, this new diamond tool embodies a new principle of wheel dressing. By placing two or more diamonds in each tool, with each diamond cutting in the same track, the True-line tool is said to eliminate delays and defects. The diamonds always



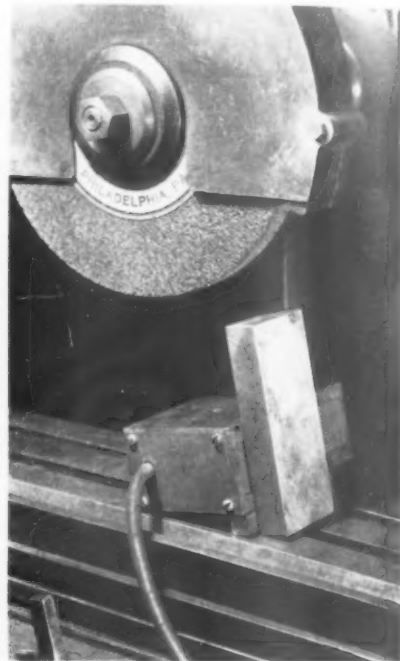
New diamond tool embodying a new principle of wheel dressing.

point to the wheel center. Their position never changes and the tool needs no resetting, turning, or changing until the diamonds are completely used.

This tool is said to be especially effective in reproducing the required form whether it be straight, radial, or step.

### MAGNETIC CHUCK (H62)

Anderson & Brown Company, 3032 East 22nd Street, Cleveland, announces improvements on their magnetic chuck including such features as quick set-ups and intense holding power. Called the "Magnetic Body Flo", a powerful magnetic flux flows from the chuck and locks the work, the steel parallels, and the magnetic chuck to the working surface of the grinder.

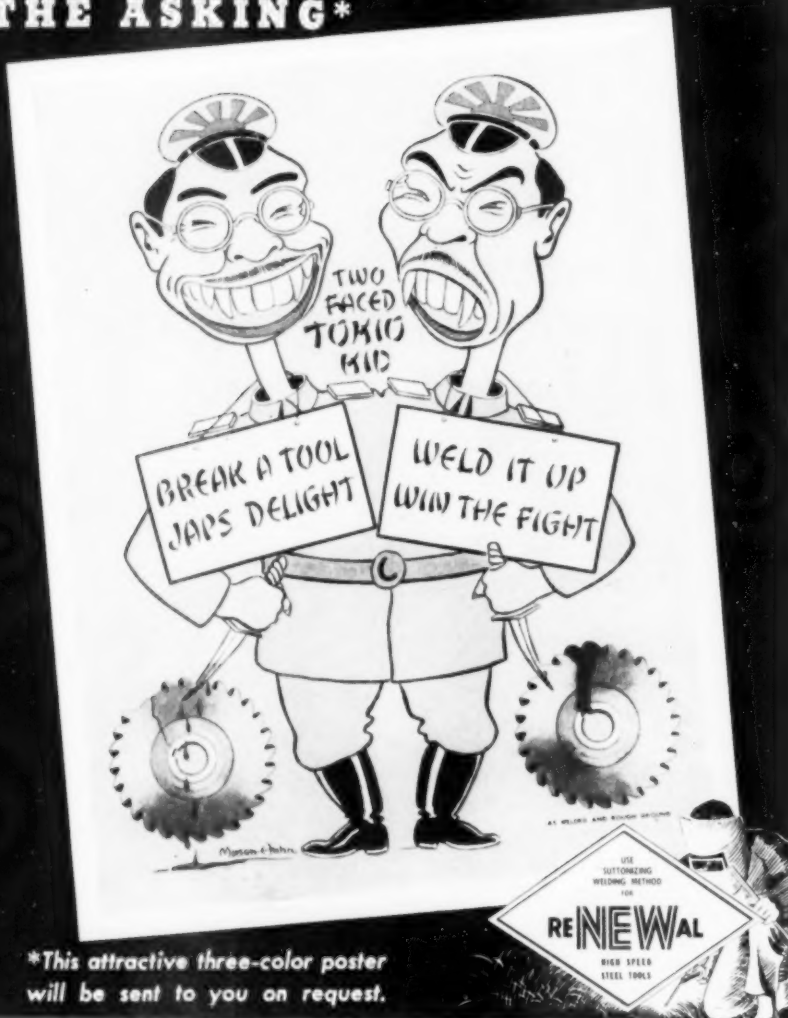


New magnetic chuck with such features as quick set-ups and intense holding.

Really a two-in-one unit, the chuck is also a demagnetizer and the work is automatically demagnetized as it is removed from the grinder. It may also be used as a portable demagnetizer. Horizontal, angular, or vertical set-ups are said to be quickly made with this chuck.

It is claimed to be equally satisfactory for wet or dry grinding. Many sizes of work can be handled ranging from the smallest to the limits of the working table.

## THIS POSTER IS YOURS FOR THE ASKING\*



\*This attractive three-color poster will be sent to you on request.

The above poster refers to tools reclaimed by the "Suttonizing" welding process. This new method can be applied only in our own plant. Tools sent to us can be repaired and returned promptly without post heat treatment in the majority of cases. Wire, phone or write us today for poster and further information.

EUREKA electrodes are sold for your use on oil, water and air hardening steels as well as for hot forming and cold drawing dies.

**WELDING EQUIPMENT & SUPPLY CO.**  
222 Leib Street • Detroit, Mich.

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### PNEUMATIC AIR VISE (H63)

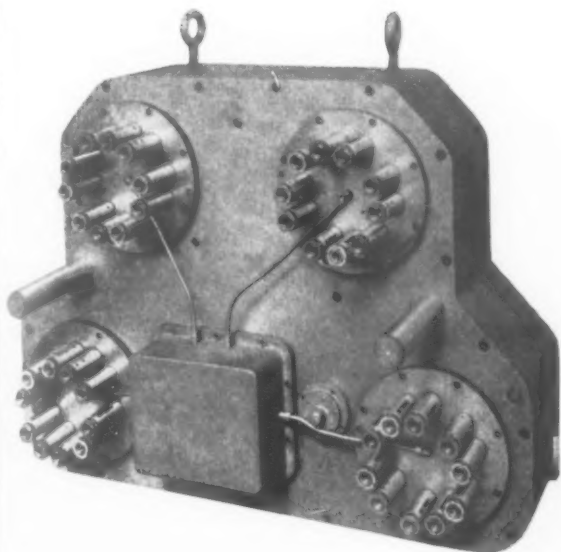
Operated by compressed air, with a foot control, this new air vise manufactured by the W. R. Brown Corporation, 5720 Armitage Avenue, Chicago, leaves

**Buhr**

## MULTIPLE PRODUCTION DRILL HEADS

*Help You*

**GET THE MOST OUT OF THE  
MACHINES YOU HAVE**



Forty-spindle Buhr drilling and reaming head. For drilling and reaming holes in Aircraft Motor Cylinder. Vertical adjustment in all spindles. An oil pump provides positive lubrication.

**BUHR MACHINE TOOL CO.**

ANN ARBOR

MICHIGAN

*Specialists in Multiple Spindle Drilling,  
Boring, Reaming, and Tapping Equipment*



Simonds Saw and Steel Company, makers of quality saws since 1832, have this to say in their new general catalog — "Our Precision method of grinding on new hydraulic rotary grinders produces perfectly flat and perfectly balanced saws which run true and cut better lumber."

Here is another world-known product that depends on

**ARTER ROTARY SURFACE GRINDERS**  
for precision finishing.

Are you getting all possible production from your grinders? Arter engineering will help you to gain production-plus.

**ARTER GRINDING MACHINE COMPANY**  
WORCESTER, MASS., U. S. A.

both hands free to work and is said to speed up production on drilling, tapping, light milling, punching, bending, straightening, staking, stamping, and riveting.

Claiming as many as 1200 operations per hour, the ram of this vise is driven by a life-long, multiple type diaphragm instead of a piston. The movable jaw has a maximum travel of  $\frac{1}{2}$  inch. The jaw faces are of soft steel and an adjustment screw enables the operator to set the movable jaw anywhere up to its maximum opening of 3 inches.

### INFORMATION FREE

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### UNIVERSAL TOOL HOLDER (H64)

This tool holder, built by the Lane-Wells Company, Los Angeles, consists of a tool post which can be fitted on to



New tool holder which can be fitted on any engine lathe.

## Now more than ever you need this help for Training Tool and Die Makers

Widely used by many companies and trade schools throughout the U. S. it meets urgent need for a complete, up-to-date text for training new men, "refreshing" older men, or trouble shooting in the tool room. The shortage of tool and die makers must be met fast by men who know the "whys" and "hows". This book gives them both and more. It shows how to select tool steel; how to make tools; how to avoid trouble; how to improve tool performance. Read below what others say about this modern text.

### TOOL STEEL SIMPLIFIED

By Frank R. Palmer  
A Vice-President of

The Carpenter Steel Company

315 pages — 205 illustrations

\$1.00 postpaid in U. S. A. Elsewhere \$3.50

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**22,000**  
COPIES  
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Low price of \$1.00 per copy makes it economical for training use. Elementary enough to meet the urgent need for a good text for apprentice training. Practical enough to be helpful in advancing the skilled tool maker. Contains hundreds of practical suggestions that can be quickly applied in daily work to get improved tool performance. Send coupon below for a copy of Tool Steel Simplified.

### Read What Others Say:

... Consider it one of the very finest books that our local schools of vocational and adult education might use in training of apprentices in machine trades.

R. L. Welch  
Supervisor Industrial Education  
State of Wisconsin

... Simple and easy to read. Contains useful information which commends it to technical men, semi-technical men, and men in the shops who want to improve their ability to make the best use of tools.

Prof. Bradley Stoughton  
Dept. of Metallurgical Engineering  
Lehigh University

... Valuable textbook for apprentices and journeymen, and an equally valuable handbook for tool designers and others concerned with the use of tool steel.

J. B. Chalmers  
Director of Training  
The Yale & Towne Mfg. Co.

... have read and re-read the book. Became absorbed in finding out and learning so many things I never knew before. Chapter 17 on quenching is worth the price of the book... will need 45 copies for classroom use.

F. E. Laverty  
Worcester Boys' Trade School  
Worcester, Mass.



This holder is said to cut tool changing time drastically.

tool changing time to approximately 5 seconds. In practice, the lathe operator has several heads—each carrying a certain tool to perform an operation on the stock. The first head is placed in the tool holder and locked in place by a quarter turn of the control handle. This operation is repeated for each head, the

**SEND  
Now**

THE CARPENTER STEEL COMPANY  
Reading, Pa., Dept. 4-J

YES, I WANT TO SPEED UP TRAINING WORK. Please send me postpaid your convenient handbook "Tool Steel Simplified". I enclose \$1.00 (\$3.50 outside the U. S. A.) in full payment.

Name

Company  Firm Name Must Be Given

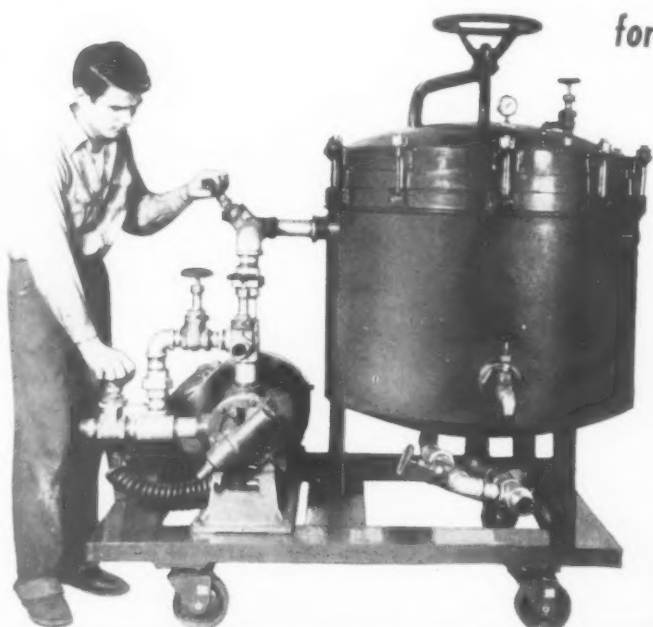
Address

City  State

# Changes sludge to sparkling liquid

Sparkler horizontal plate filters have many exclusive advantages that make them simple and quick to prepare, clean and operate. The modern, straight down filtering process through nested interchangeable plates may be helped by either air or gas pressure, or by vacuum, using any filtering powder or other aids.

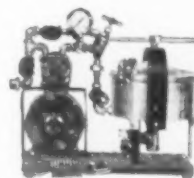
Capacities from one pint to 10,000 gallons per hour, depending upon the viscosity of the product and size of filter. Great advancement in filtering speed and quality have been recently brought out by our engineers, who will advise you cheerfully—no obligation. Just write.



for

cutting  
oils  
grinding  
oils  
honing  
oils  
transformer  
oils  
plating  
solutions

or any other  
liquid product.



This small, inexpensive laboratory filter will pre-determine results from filtering operations on production filters. Write for information on your special needs.

**SPARKLER MANUFACTURING COMPANY**

276 LAKE STREET, MUNDELEIN, ILL.

See our Exhibit — Booth A-523 National Metal Exposition

**SPARKLER**

**HORIZONTAL  
FILTERS  
PLATE**

## ENGINEERING SERVICE, INC.

DESIGNERS & CONSULTANTS

**TOOLS & DIES**

**JIGS & FIXTURES**

**METHODS & PROCESS**

**PLANT LAYOUT**

**SPECIAL MACHINERY**

FACILITIES  
AND 15,000 MAN-HOURS  
PER WEEK AVAILABLE FOR  
DEFENSE PROJECTS

**3437 GOLDNER — CORNER MICHIGAN & 30TH**

**DETROIT, MICHIGAN**

**PHONE LaFayette 4470**

change requiring about 5 seconds each time.

### AIRDUSTER AND CLEANER

(H65)

The Paasche Airbrush Company, 1923 Diversey Parkway, Chicago, has just announced a new type of airduster to speed the cleaning and dusting of tools, machines, parts, and instruments. The gun operates on airpressure and consumes from 5 to 15 c.f.m., depending upon the nozzle used.

Many places ordinarily inaccessible



Airduster designed to speed the cleaning of tools, machines, and instruments.

are said to be reached easily and cleaned with this gun. To increase its utility, it has a 3 and 6 inch extension

which may be coupled together. The airgun is constructed of brass.

### SMALL GRINDER

(H66)

Claimed to develop greater power and higher load speed than any grinder its size and weight, a 35-ounce electric tool has been introduced by the Paul F. Hermann Company, 3400 Forbes Street, Pittsburgh. Called the "Precise 35" it can be used for grinding, cutting, engraving, piercing or stitching, carving, and polishing.

This grinder has a universal motor which develops 1/7 hp. The motor shaft and high precision spindle, with its high speed chuck, revolve on four ball bearings.



Here is the new 35-ounce grinder in use. Adaptable to many other uses.



FOR  
LONGER LIFE

for  
CARTRIDGE CASE  
DIES & PUNCHES

GUN RECOILS

AVIATION PARTS

BROACHES

BEARINGS

ETC.

## THE MODEL 325AC SUPERFINISHER WILL SPEED UP YOUR WAR EFFORT

Above is illustrated our universal type of SUPERFINISHER for high production work. This is a very versatile machine and attachments are available to do internal as well as external work.

For aviation motor parts, landing gear parts, recoil mechanisms for guns, various parts used in building of tanks, cartridge case dies and punches; in fact, wherever a fine surface is required, SUPERFINISHING is vitally im-

portant. Attachments are also available for this machine for doing flat work. These machines are already doing a fine job in the war effort of many important plants.

SUPERFINISHING is indeed playing an important role in the war program. It is a quick and economical method of obtaining a fine surface finish, and this basic machine is so versatile that most jobs can be handled on it.

WRITE FOR DESCRIPTIVE CIRCULAR

ROUNDS AND FLATS SUPERFINISHED SIMULTANEOUSLY  
MULTIPLE HEADS CAN BE MOUNTED ON SAME MACHINE

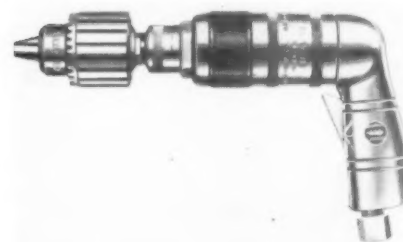
A UNIVERSAL MACHINE FOR EXTERNAL & INTERNAL WORK

OHIO UNITS MANUFACTURERS • DAYTON, OHIO, U. S. A.

### PNEUMATIC DRILL

(H67)

The Aro Equipment Corporation of Bryan, Ohio, announces the addition of new 3/8 inch capacity air drills, straight and right angle, to their line of rotary



Rotary pneumatic drill, available as straight or right angle tool.

### INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.



**MR. ARBUTHNOT!**

### ... McKINNEY can help you

Sure, we all know the change-over to war production creates many tough problems. Often it is necessary to retool and rearrange your normal production set-up.

But don't let it get you down, Mr. Arbuthnot. Just call in McKinney to lend you a hand.

Our twenty years' experience as industrial designers, engineers and plant layout specialists qualifies us to diagnose your operations "from the ground upward" ... to gear your plant for maximum war-time efficiency.

Because we are manufacturers, as well as design engineers, we are familiar with the problems of production ... maybe with the very one that's bothering you, Mr. Arbuthnot!

#### McKINNEY SPECIALIZED SERVICES

- Machine Designing
- Tool Designing
- Process Engineering
- Product Engineering
- Plant Layout and Routing for top efficiency
- Designers and manufacturers of dies, jigs, fixtures and special machinery.

# McKINNEY

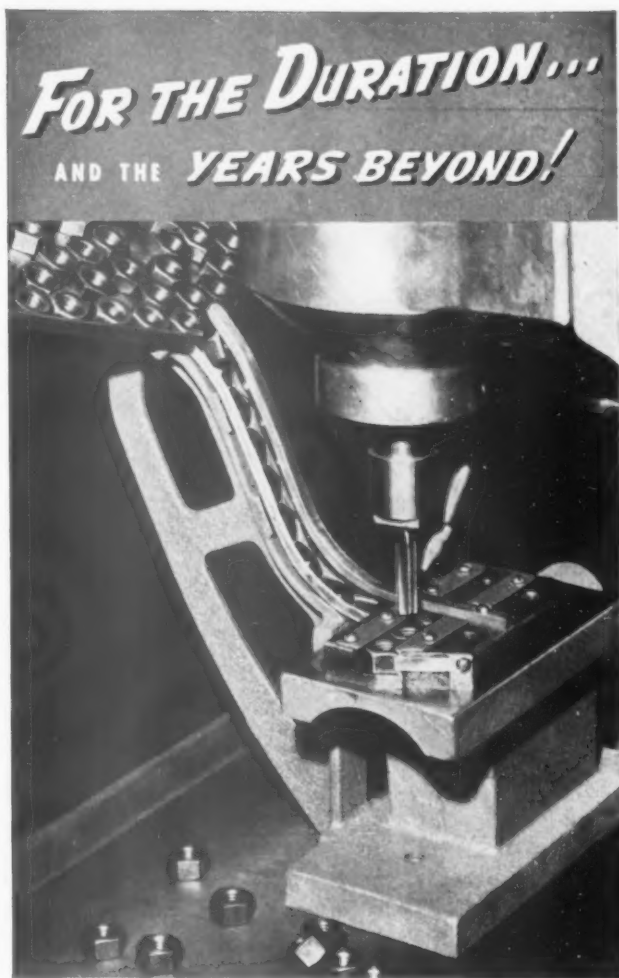
TOOL & MANUFACTURING CO.

1688 ARABELLA RD. CLEVELAND, OHIO

"DESIGN ENGINEERS



FOR TWENTY YEARS"



Haskins designed standard nut fixture with an air operated plunger positions these  $\frac{3}{8}$ " hex nuts and ejects them after tapping. Operator has only to place the blanks in the hopper. Class 3 fit.

**MORE** than a temporary speed-up measure, Haskins Tappers are a profitable, long-term investment in production efficiency. Bought for war time needs, they can be quickly and inexpensively converted to private industry production. Haskins Tappers are *standard* machines. They will *continue* to give you lower tapping costs per man and machine hour long after Victory is won! R. G. Haskins Company, 2756 W. Flournoy St., Chicago.

NEW BOOKLET—"Holding Fixtures for Haskins Tapping Machines"—contains many new ideas. Send for a copy.



# HASKINS



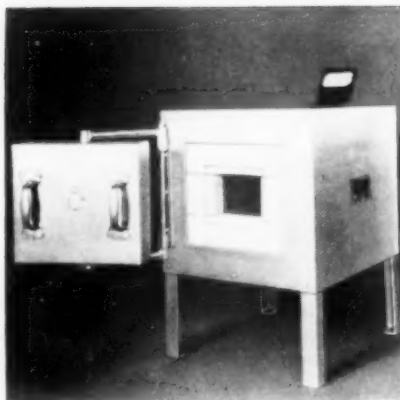
*Precision*  
**TAPPING  
EQUIPMENT.**

—NEW EQUIPMENT—

pneumatic tools. These drills are said to be suitable for a wide range of jobs for defense plants, aircraft builders, and shipyards.

**ELECTRIC MUFFLE FURNACE (H68)**

A new full muffle electric box-type furnace with all-refractory hearth has been added to the Falcon line of electric furnaces manufactured by H. O. Swoboda, Inc., 133 Thirteenth Street, New Brighton, Pa. This furnace is said to be highly efficient for heat treating high

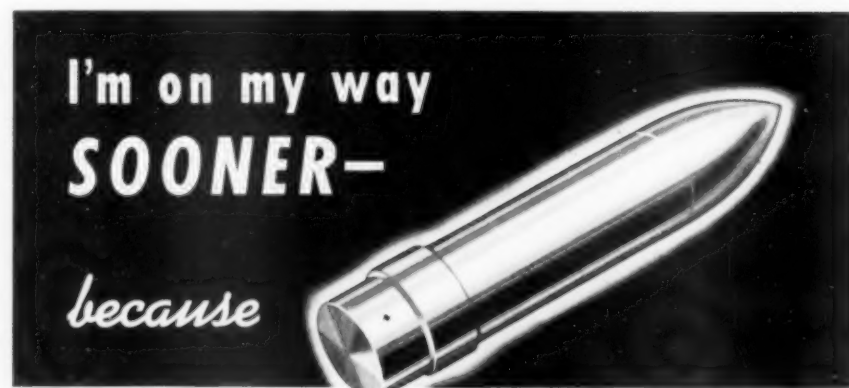


—NEW EQUIPMENT—

speed tool steels, hardening, tempering, and many other tool room and laboratory heating applications.

Construction features include a full box-type muffle and all-refractory hearth, completely surrounded by heating elements which are said to eliminate temperature variations in the hearth chamber. The chamber is 33 $\frac{3}{4}$  inches high, 51 $\frac{1}{4}$  inches wide, and 12 inches deep.

Full muffle electric box-type furnace.



## TRU-LINE TOOLS dress centerless grinding wheels with amazing speed and accuracy!

Shot, shell and projectile forms are rolling off production lines much faster these days because Tru-Line Tools eliminate all the defects and delays incidental to using single diamond wheel dressing tools.

Once positioned to the wheel the Tru-Line Tool needs no resetting, no turning and no changing until the diamonds are completely used.

The desired wheel form is easily obtained with absolute accuracy and, because every dressing is right the first time, there is great

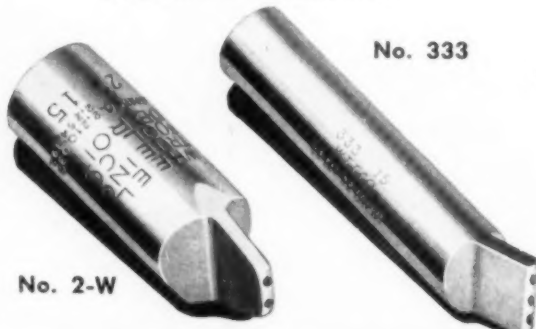
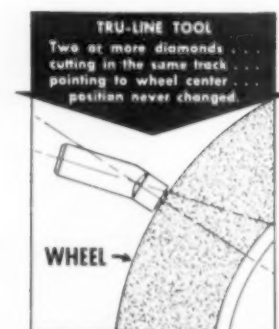
saving in down-time. The wheel is cleaner and freer-cutting and produces many more uniform pieces between grindings.

Savings in wheel cost may be 50% because fewer dressings are needed and fewer passes per dressing.

Tru-Line Tools are available for fast production of all shot, shell, and projectile forms that are centerless ground.

Send for illustrated folder describing the revolutionary, patented Tru-Line Principle, and engineering data sheets.

Covered by U. S. and Foreign Patents



## WHEEL TRUEING TOOL COMPANY

3206 W. Davison

DETROIT

Established 1910

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For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.

**COOLANT PUMP (H69)**

A new coolant pump that may be made an integral part of any grinder, lathe, cutting or drilling machine, or can be moved from job to job as needed, has been announced by Brady-Penrod, Inc., 1216 West Second Street, Muncie, Indiana.

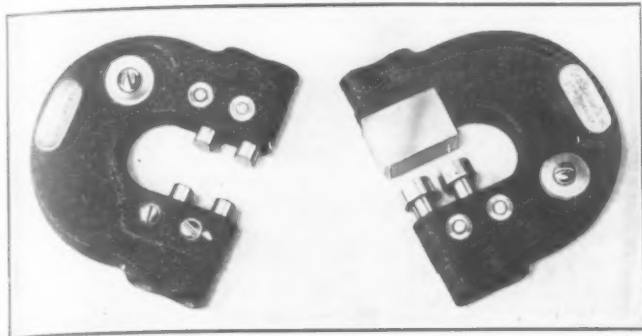


Versatile new coolant pump that may be made an intricate part of various tools.

Available in three different depths from flange—4 $\frac{7}{8}$ , 9, and 15 inches—this pump can also be made in special depths. By actual test, the pump is said to deliver as high as 70 per cent hydraulic efficiency. Known as model 7500, it has a plate adapter which enables it to fit any tank or base opening. The motor capacity is from 1 $\frac{1}{8}$  hp to 1 $\frac{1}{2}$

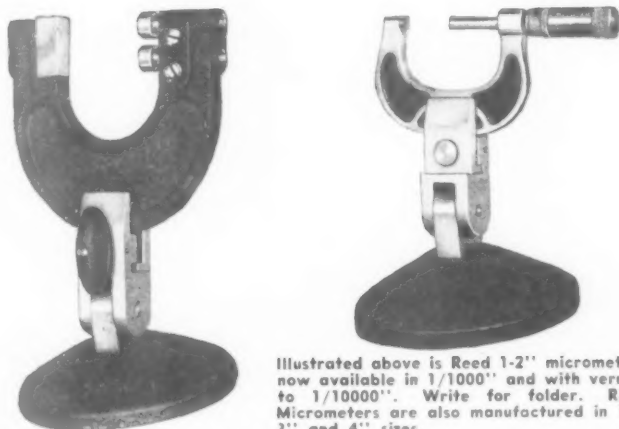
THE TOOL ENGINEER

# SNAP GAGES



Many plants engaged in war work are using Atlantic Adjustable Limit Snap Gages to quickly and accurately inspect parts urgently required. These gages are manufactured to American Gage Design Standards. Frames are made of Meehanite, a material that will retain its form indefinitely. Thousands of Atlantic Snap Gages are used daily in America's leading plants. When Snap Gages are used little dependence is placed upon the individual's measuring skill. After the gage is set practically any operator can tell by the go and no-go parts of the snap gage whether the work under inspection has been produced to the correct limits.

**WRITE TODAY FOR FOLDER SHOWING  
ALL TYPES PRODUCED**

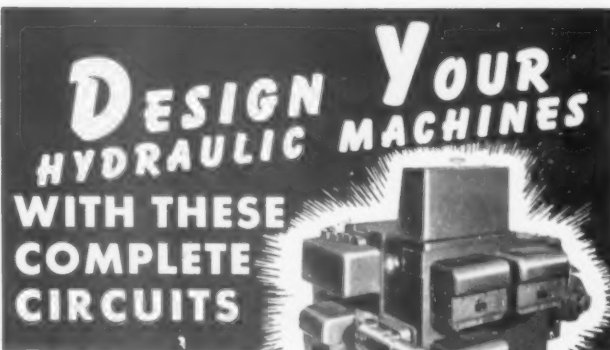


Illustrated above is Reed 1-2" micrometer, now available in 1/1000" and with vernier to 1/10000". Write for folder. Reed Micrometers are also manufactured in 1", 3" and 4" sizes.

## SCHERR TOOL STAND

The SCHERR TOOL STAND is used as a vise or clamp for holding micrometers, snap gages and other tools. It eliminates possibility of error due to body heat which can distort micrometers and gages sufficiently to make accurate measurements difficult. The stand speeds up gaging since it frees both hands for checking the work, increasing skill and reducing fatigue. Price Scherr Tool Stand \$7.50. Write for leaflet.

**GEORGE SCHERR CO.** 132 Lafayette St.  
New York, N. Y.



Complete hydraulic circuits can be furnished as units or panels for Milling, Boring, Grinding, Drilling and other metal working machines. No Hydraulic knowledge is necessary to obtain a superior hydraulic machine. You merely establish the functions of the machine to be done hydraulically; our engineers will design the proper circuit and unit while you design the machine.

## Use Only ONE Hydraulic Unit For Any Combination of:

**Feed and Traverse** for multiple or single tools—any type—any number of stations. Feed and traverse units can be horizontal, vertical, angular or in any combination of different positions.

**Clamping** of work piece in fixture with direct or indirect pressure—single or multiple stations.

**Indexing** or work transferring on trunnion type fixtures or horizontal indexing . . . also hydraulic actuation to index pin location.

## TWO TYPES OF UNITS AVAILABLE

A Barnes self-contained hydraulic unit, as shown above, is furnished with necessary pumps and valves to complete the hydraulic functions of your machine. Hydraulic oil reservoir is included. Providing cylinder space in your machine design and connecting two pipes to each cylinder constitutes your total hydraulic effort. A Barnes Panel Unit is similar to the self-contained unit except provision must be made in the machine for oil reservoir. For complete information write for the booklet offered below.

**FREE New Data:** Included in this 40 page book are typical installation circuits, complete data covering piston and gear pumps and complete information covering basic elements of construction and installation of standard units used in these highly successful hydraulic circuits. Write for your copy today. Ask for Bulletin TE942.



## John S. Barnes Corporation

DETROIT SALES OFFICE  
503 NEW CENTER BLDG.  
TR-1-1704

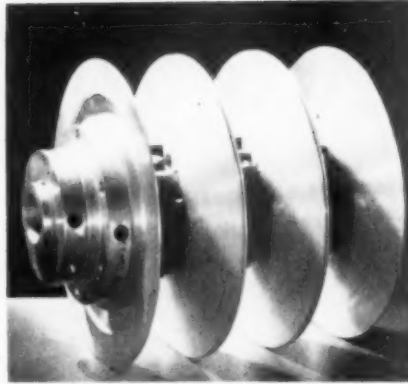
MAIN OFFICE  
AND FACTORY  
ROCKFORD, ILL.

—NEW EQUIPMENT—

lip and it has controlled flow of any standard coolant fluid from 4 g.p.m. to 100 g.p.m.

**VARI-PITCH SHEAVE (H70)**

A new wide-range, vari-pitch sheave has been developed by the Allis-Chalmers Mfg. Company, Milwaukee, Wisconsin to meet the need for power transmission in wider ranges of speed variation. Speed variations from 66 to 116 percent are said to be possible with this new, wide range sheave.



—NEW EQUIPMENT—

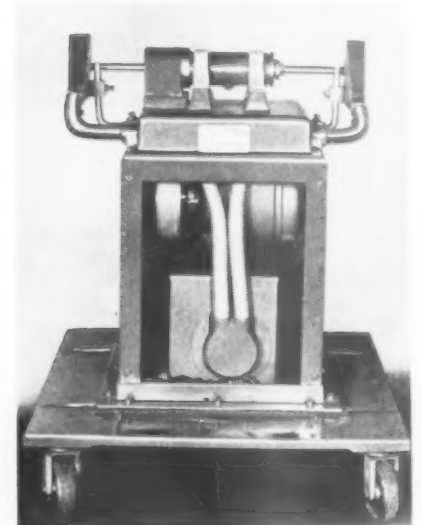
The new sheave is used with a companion sheave grooved for new, wide Texrope V-belts. These sheaves are manufactured in sizes to fit the shafts of all standard NEMA motors from fractional to 30 horsepower. Companion sheaves are made in sizes to meet the requirements of the wide-range applications.

At left is new vari-pitch sheave for wider ranges of speed variation.

**DUST COLLECTOR (H71)**

A self-contained dust collecting system called the "Dustkop" that has its own fan, motor, and filter system complete, is being manufactured by the Agat-Detroit Manufacturing Company, Book Tower, Detroit.

This unit pulls the dust-laden air away from the grinding wheels through the flexible metal hose and into the unit itself. There it goes through a spun glass filter which stops the dust and lets it fall and permits the clean air to re-circulate into the room. The intake hoods of the grinder units are supported so that they can be moved up or down.



Simple self-contained dust collecting system with fan, motor and filter.

**HYDRAULIC DRILVISE (H72)**

A new drilvise designed for holding work on the table of all types of drill

**The New WELLS SAW**

**V-12**

**IT'S A LARGE CAPACITY, FAST AND ACCURATE MACHINE FOR HEAVY DUTY JOBS**

Now you can have the advantages of continuous metal cutting in a heavier, more capable band saw—the new hydraulic-controlled Wells V-12. Many important features proved in the Wells No. 8 and No. 5, are part of this new machine, together with special additional advantages that are built into the V-12. Feed and lift are hydraulically controlled, vise is new and quick action—capacity is 13" diameter rounds and 13" x 16" rectangles... the base is solid and... But write today for full details on this new Wells machine. You will find it can give you the continuous metal cutting results you like.

A large stock of blades is available at all times.

**WELLS MANUFACTURING CORPORATION • Three Rivers, Michigan**

**Wells METAL CUTTING BAND SAWS**

CHECK THESE SPECIFICATIONS of the NEW Wells V-12

Capacity: ..... 13" x 16"

Rectangle ..... 13" dia

Round ..... 30, 90, 150

Speeds ft. per min. .... Adjustable

Guides ..... Hydraulic-Controlled

Feed ..... New quick acting type

Vise ..... New quick acting type

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.

★  
**2 Weeks Delivery**

on Standard

**JOHNSON**  
FURNACES for  
INDUSTRY  
FOR MORE THAN 40 YEARS

Carrying A1-J Priority Rating or Better



**JOHNSON No. 130**

*Means quick, high, accurate temperatures for hi-speed steels.*

This Johnson Furnace reaches 2300° F. in 22 minutes, saving

valuable time, gas, and floor space. Use it for heat-treating high speed steels, for hardening punches, dies and tools. The 13" x 13½" x 5½" fire-box is heavily lined

with insulating refractory. Four Johnson burners provide the heat. Only \$248, F.O.B. Factory.

**JOHNSON No. 820**

**Tempering and Drawing Furnace**

For speedy tempering of tools, dies, small parts, non-ferrous castings and parts, and any work requiring temperatures from 275° to 1200° F. Ideal for heating aluminum forgings and rivets. Get the Facts.



**FREE—Use Coupon**

JOHNSON GAS APPLIANCE CO.  
550 E Ave. NW.,  
Cedar Rapids, Iowa

Please send me free Johnson Catalog.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

**Sales Offices:**

Bourse Bldg., Philadelphia  
120 Liberty St., New York City  
C. B. Babcock Co., 475 11th St.  
San Francisco

*Better Results*  
IN LESS WORKING TIME WITH



WELDON ROBERTS

**Brightboy**



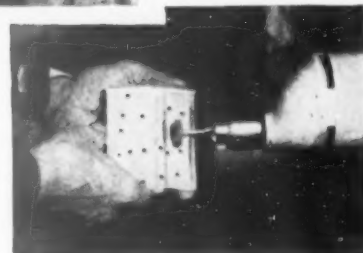
*"The Soft Rubber Binder Cushions The Abrasive"*

**CLEANING—POLISHING**

Tools, taps, dies, flush sets, drills, parts, in aluminum alloy, steel or brass

**DE-BURRING—FINISHING**

Holes and edges in alclad part



IN HUNDREDS of war industries, Brightboy is contributing savings in time and work. Brightboy's action is unique—not a grind or a buff. Brightboy wheels de-burr, polish and put on a slight radius, all in one operation. It's the resilient rubber binder that does it! Brightboy shapes for manual work also have innumerable applications. Brightboy is particularly effective in close tolerance operations. Available to war industries through recognized mill supply distributors. Our field men are at your service. Write today for catalogs and prices if your distributor cannot supply you.

**BRIGHTBOY INDUSTRIAL DIVISION**

WELDON ROBERTS RUBBER CO., Newark, N. J.

Removes Light Digs, Tool and Heat Marks

Cleans Welded and Soldered Joints

Finishes Dies

De-burrs Light Stampings and Machined Parts

**1. NO "TIME OUT" CHANGES IN METHODS—**

Brightboy is used in the conventional manner

**2. NO SPECIAL TRAINING NECESSARY**

**3. NO SPECIAL PREPARATION—**

Ready for immediate use

**4. NO WASTE—**

Every bit is usable

WHEELS • STICKS • BLOCKS • TABLETS  
RODS • SPECIAL SHAPES



presses, planers, shapers, milling machines, surface grinders, lathes, and cut-off saws has just been announced by the Studebaker Machine Company, 9 South Clinton Street, Chicago.

This new tool is said to permit the use of both hands in the operation, set-up, and removal of work from the machine on which it is mounted because it is entirely foot controlled and hydraulically operated. It is claimed to exert more than 10,000 pounds of pressure per square inch between the jaws.

The unit requires no outside power or air supply and the parts are portable

to be moved from machine to machine. A 6-foot length of rubber tubing connects the hydraulic foot control base to the vise.

### INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.

## TASK FORCES

and

## TASK METALS

Just as a task force is sent out to accomplish a definite war operation, so is Ampco Metal selected to do a definite application job.

Where parts are subject to highly stressed conditions—where a bronze is needed that can "take it" under severe operation—where good bearing characteristics and long life are imperative—Ampco Metal does full duty and fulfills its task.

Physical properties of Ampco Metal are highlighted in the table below. To meet certain government specifications, modifications of standard grades are available to conform to specific chemical requirements . . . These Victory Grades are subject to the standard Ampco laboratory control that extends from raw material through to the finished product.

PHYSICAL PROPERTIES OF AMPCO METAL

Consult with Ampco Engineers. Ask for data sheet "Aluminum Bronze as an Alternative Specification."

AMPCO GRADE	TENSILE STRENGTH	YIELD STRENGTH	ELONGATION IN 2"	RED. OF AREA	BRINELL HARDNESS
12	65-75,000	25-29,000	22-27%	22-27%	109-124
16	70-80,000	32-37,000	18-22%	16-20%	131-156
18	77-85,000	34-40,000	10-14%	6-10%	159-183
18-22	90-100,000	45-55,000	3-7%	3-7%	202-235
18-23	95-105,000	43-50,000	10-15%	12-18%	183-207
20	83-90,000	38-43,000	2-6%	1-4%	212-248
21	70-80,000	42,000 min.	1-4%	0-4%	285-311
22	70-85,000	45,000 min.	0-2%	0-2%	321-352

### AMPCO METAL, INC.

DEPARTMENT TE-9

MILWAUKEE, WISCONSIN

# AMPCO METAL



THE METAL WITHOUT AN EQUAL

## CLEANING MACHINE

(H73)

The American Foundry Equipment Company of Mishawaka, Indiana, is manufacturing an airless, abrasive blast cleaning machine as a result of tests made to determine the proper equipment for cleaning huge quantities of cartridge belt links.



Airless, abrasive blast cleaning machine for cartridge belt links.

Numerous requirements were demanded of the cleaning machine. They included the following: It must remove all scale encrustations resulting from the heat treating processes, and remove any burrs remaining after the punching operations. The surface of the links must be thoroughly roughened to serve as a bond for the zinc or Parkerized coating; no breakage or damaging of links during cleaning; and it must be capable of maintaining a high production schedule.

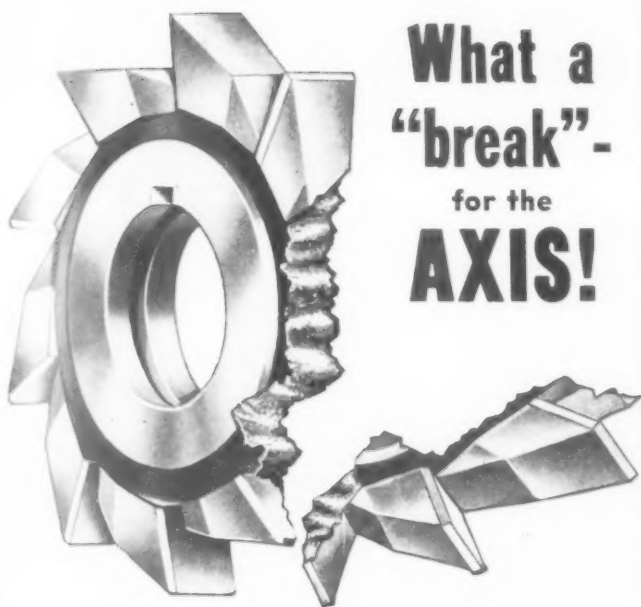
The cleaning machine made by this company is called the "Wheelabrator Tumblast" and measures 27 by 36 inches. It is equipped with a rubber apron conveyor. An automatic loader feeds the links into the machine where they are subjected to an abrasive grit stream, after which they are removed from the machine and cleaned.

## DIES FOR INJECTION MOLDING

(H74)

A new idea in preparing dies for injection molding of plastics has been introduced through the development of certain standards by the Detroit Mold Engineering Company.

These standards are said to enable a molder to reduce his die preparation time to such an extent that he can ad-



## What a "break"- for the **AXIS!**

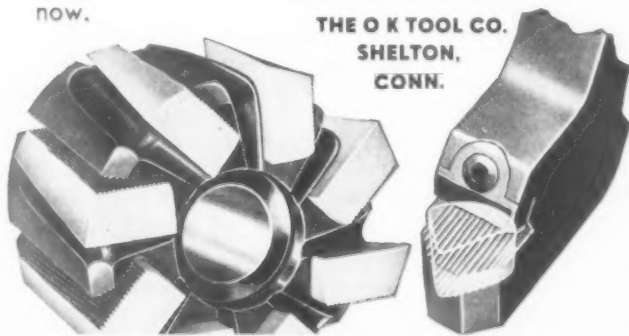
Two things will greatly reduce tool breaks:  
(1) CARE IN THE USE OF TOOLS — This goes for ALL tools from twist drills up to giant milling cutters, the breaking of which can tie up a whole department.

In setting up milling jobs, watch the "little" things. Select a cutter big enough for the job. Mount it right. Check and re-check speeds. Don't nick the cutter in taking it down, nor heave it onto a crowded bench. In short, don't miss a trick anywhere. Tools are "guns." Keep 'em working!

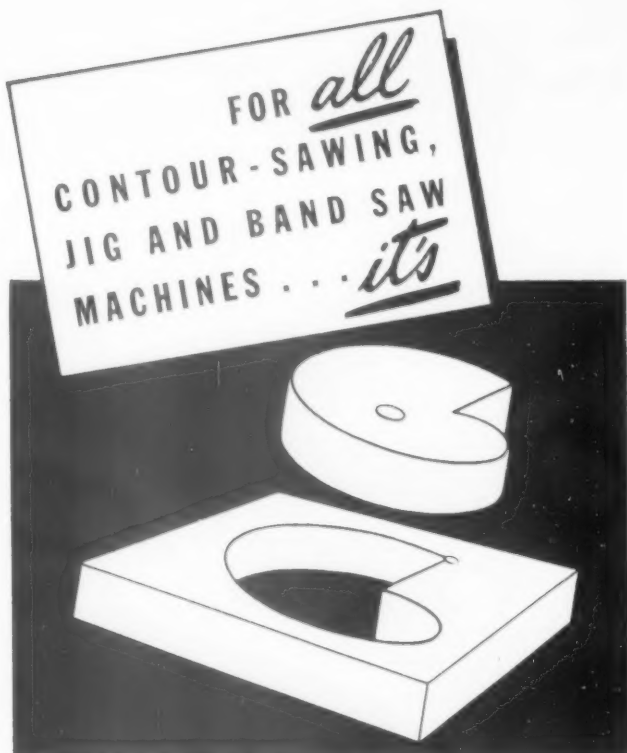
(2) CARE IN THE PURCHASE OF TOOLS — Insist on up-to-date tools, particularly in milling cutters and single-point tools. In the O K Inserted-Blade types only the edges are made of H. S. steel; the bodies are drop-forged steel, ruggedly proportioned.

If a tooth in a solid cutter breaks, a repair (if possible) is generally a time waster. If a blade in an O K cutter breaks, a new one is quickly inserted. O K Tools are available only on priority. If interested, please contact us now.

THE O K TOOL CO.  
SHELTON,  
CONN.



**SYSTEM**  
OF INSERTED-BLADE METAL CUTTING TOOLS



FOR *all*  
CONTOUR-SAWING,  
JIG AND BAND SAW  
MACHINES . . . *its*

## MILFORD PROFILE SAW

Manufacturers everywhere are speeding up production with this tried and proven product. By cutting complicated shapes and parts, tools, jigs and dies faster (and cheaper, too) with MILFORD PROFILE SAW, they are keeping their basic machine tools free for uninterrupted production.

Even today, deliveries are prompt. While more Profile Saw is being made and shipped than ever before, our greatly increased capacity is taking care of the demand.

Use the best there is . . . the perfected product of specialists with over half a century's experience behind them . . .

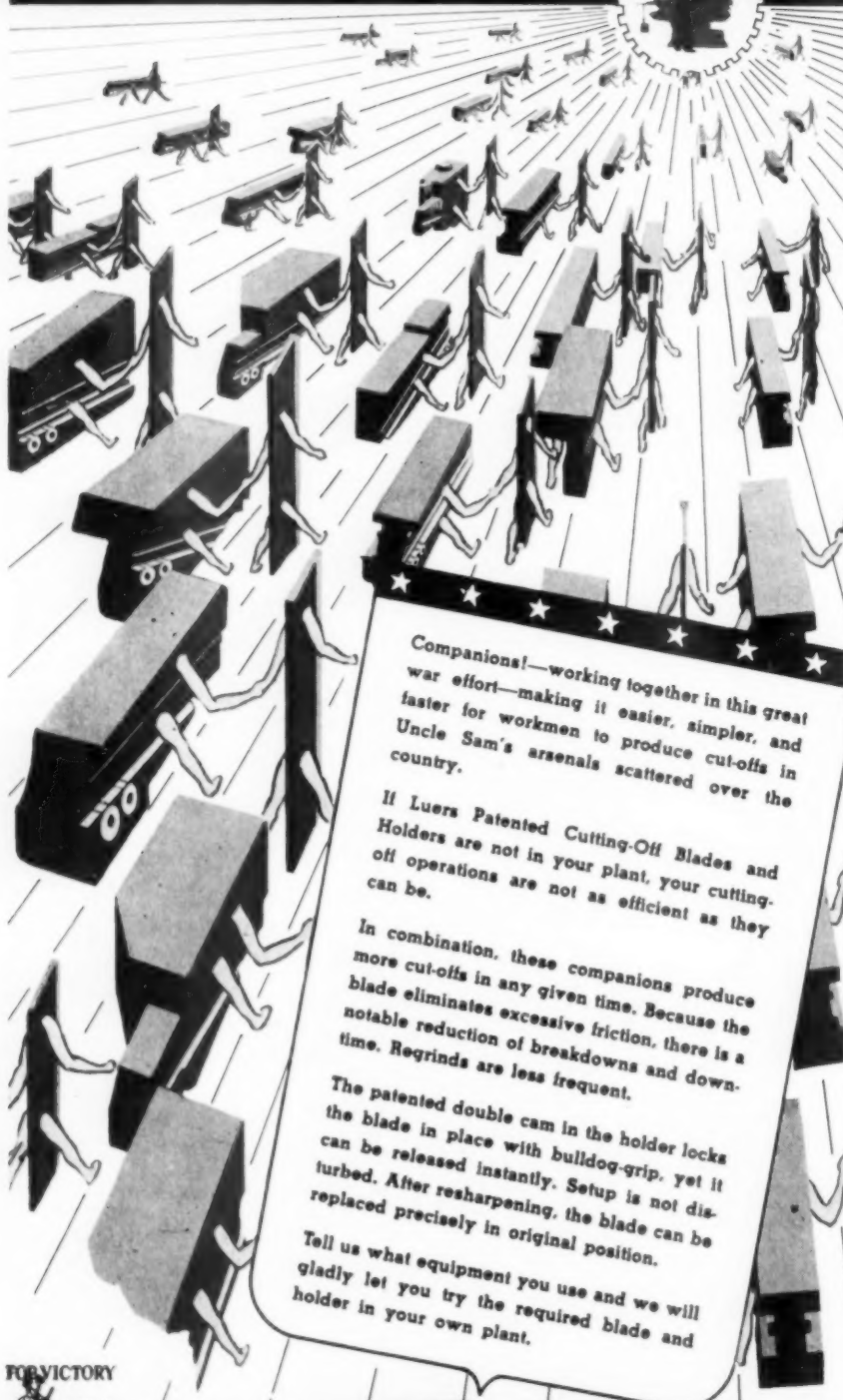
**MILFORD PROFILE SAW**

Order from your Mill  
Supply Distributor

Perhaps you have a band saw machine that can be easily adapted to Profile Sawing. If so, write us for directions and a free sample. Include specifications of the machine and cutting job you have in mind.

**THE HENRY G. THOMPSON & SON COMPANY**  
NEW HAVEN, CONNECTICUT  
Also makers of MILFORD REZISTOR HACKSAW BLADES

LUERS PATENTED CUTTING-OFF  
BLADES AND HOLDERS  
**HAND IN HAND  
TO  
VICTORY**



Companions!—working together in this great war effort—making it easier, simpler, and faster for workmen to produce cut-offs in country.

If Luers Patented Cutting-Off Blades and Holders are not in your plant, your cutting-off operations are not as efficient as they can be.

In combination, these companions produce more cut-offs in any given time. Because the blade eliminates excessive friction, there is a notable reduction of breakdowns and down-time. Regrinds are less frequent.

The patented double cam in the holder locks the blade in place with bulldog-grip, yet it can be released instantly. Setup is not disturbed. After resharpening, the blade can be replaced precisely in original position.

Tell us what equipment you use and we will gladly let you try the required blade and holder in your own plant.

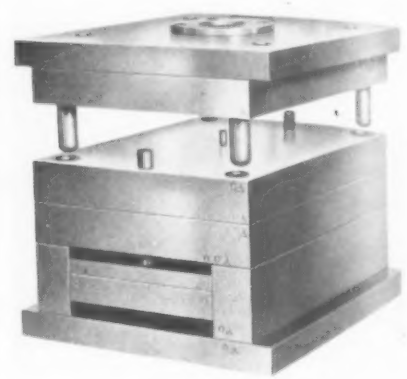


**EMPIRE Tool Co.**

8776 GRINNELL AVENUE  
Detroit, Michigan

—NEW EQUIPMENT—

vance the starting time of his production at least a week. The units are manufactured in sizes most generally used.



Injection Molding Dies  
Reduce die preparation time.

**BROACHING PRECISION NUTS (H75)**

An ingenious broaching set-up permitting rapid broaching of hex flats on nuts, introduced by the Colonial Broach Company, Detroit, is said to result in more than tripling the production capacity per machine. This set-up is in the form of a fixture designed for mounting on a Colonial senior press.

A multiple broach set-up was necessary to obtain the required production.



Broaching Hex Flats On Nuts  
Special fixture mounted on broach.

A difficult problem was that of holding the parts during the broaching operation. Before reaching this operation, the nuts are formed on an automatic screw machine, but are not threaded, so that they can be mounted on four expanding collet shafts or spindles in the fixture. Five broaches, three with two sets of cutting teeth, travel in slides incorporated in the fixture.

Indexing is by a hand wheel at the right end of the hydraulic shuttle-type fixture. The fixture is mounted on a receding type table which automatically shuttles in and out between each successive cycle of operation.

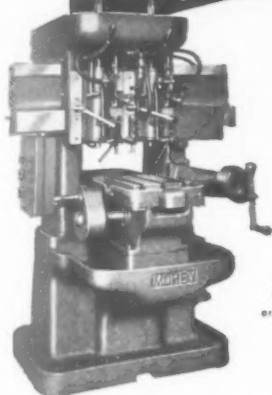
INFORMATION FREE

To receive complete information on the equipment listed in this section, place the key numbers of the desired items on the postcard on page 147 and mail to The TOOL ENGINEER.

THE TOOL ENGINEER

Patented Precision Bearings for Spindles

## MOREY 12M HIGH-SPEED VERTICAL PROFILER and MILLER



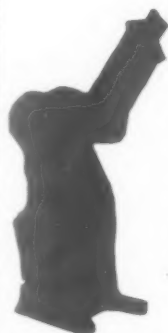
Two spindle  
or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

**MOREY MACHINERY CO., INC.**  
410 Broome Street New York, N. Y.

## T. H. L. FRONT LEVER BENCH PUNCH



PRICE WITH ONE  
PUNCH AND ONE  
DIE—

**\$50.00**

Immediate  
Shipment

Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.

Capacity  $\frac{1}{2}$ " holes through  $\frac{1}{4}$ " steel;  $\frac{3}{8}$ " through  $\frac{1}{2}$ " steel. Can also be made for holes up to  $\frac{1}{8}$ " in thinner metal. Stock punches and dies available from  $\frac{1}{8}$ " to  $\frac{1}{2}$ " by 64ths.

Weight, 70 lbs.

**T. H. LEWTHWAITE  
MACHINE CO.**

(Est. 1890)

207 E. 47 St.

NEW YORK

# LET'S GO! 3 TIMES FASTER ON ALL SANDING!



*In Metal Working:* Sterling Engineers are a concentration of fast, economical QUALITY metal finishing experiences — experience gathered in the finest plants across America. Ask to see a Sterling man!

FORGET labor shortage on sanding. Any green hand is an expert with the Sterling "Speed-Bloc" sander. Any green hand can do THREE MEN'S WORK, and do a BETTER JOB, with "Sterling". Get that "STERLING" SPEED and PROFIT that others know! WRITE! Sterling Tool Products Co., 373 E. Ohio St., Chicago, Ill.

Plug-in Compressed  
Air Driven

**Sterling**  
TOOL PRODUCTS CO.

373 E. Ohio St.

Chicago, Ill.



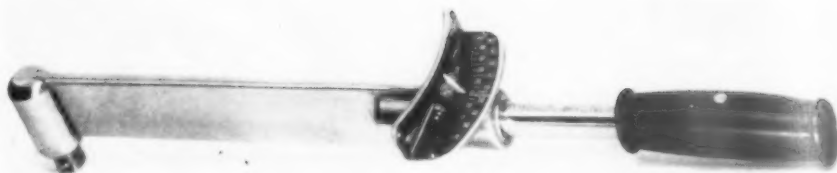
## VALUABLE BOOKLET FREE!

Get "Helpful Sanding Hints"—a gold mine for production men! Address Sterling Tool Products Co., 373 E. Ohio St., Chicago, Illinois. Don't delay! Write at once! Only a limited supply of this valuable leaflet remains.

**TORQUE  
WRENCH**

(H75)

One of the features of the torque wrench manufactured by the P. A. Sturtevant Company, Addison, Illinois, is the measuring beam, made of special heat treated alloy steel. It measures torsion without the use of levers, coil springs, or gears. This beam is said to permit an equal distribution of stress because it is taper ground. It is claimed that this taper grinding permits greater deflection over a shorter beam and re-



**Sturtevant Torque Wrench**  
Measures torsion without use of levers, springs, or gears.

sults in compactness without crowded dial readings.

The wrench has three dials so that

one is always visible to the operator. Registering without movement, the pointer is electrically welded to the head of the wrench and functions without racks, pinions, or fragile parts. The head is double riveted to the beam. A hollow, knurled, all steel handle provides a firm grip and gives balance to the tool. It also serves as a convenient place to carry a recommendation chart.

**Cutting Fussy Threads?**

...THEN YOU CAN'T AFFORD TO BE WITHOUT THESE *New Books!*

**DIES-TAPS & HOLLOW MILL HEADS**  
THE NATIONAL ACME CO. GRADE B-43

**41—CHASER GRINDING MANUAL** for foremen and operators of Namco circular and radial chaser dies and taps—32 pages with 50 illustrations of practical service hints that insure uniform threads, save time and speed production.

**42—DIE AND TAP CATALOG** explains "RS", the new universal design of collapsing tap with ground thread radial chasers—a combination that holds accuracy on difficult jobs.

—shows how circular chasers multiply ordinary chaser life twenty to forty times in hundreds of war production shops—and how you can use circular hollow mills in these same tools, with tremendous savings in tool investment and circular cutter life—"double duty" tools.



In the spirit of "all out" production—these new books are free to those who GIVE FIRM NAME.

**THE NATIONAL ACME CO.**  
170 EAST 131<sup>ST</sup> STREET • CLEVELAND OHIO  
ACME GRINDING & B AND R SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC TUCKERING DIES

**INFORMATION FREE**

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 147.

**NEW BOOKS**

*Blueprint Reading for the Metal Trades* by W. A. DeVette and D. E. Kellogg. 132 pp. \$2.50. The Bruce Publishing Company, 540 North Milwaukee Street, Milwaukee, Wis. Because it is necessary for the mechanic to be able to read blueprints, and by means of free-hand sketches to convey information to his co-workers and sometimes to clarify a drawing for himself, this text has been developed to meet this need. It is fully illustrated and includes both contents and index sections.

*Tool Designing and Tool Engineering* by John G. Jergens, 4280 East 119 Street, Cleveland, Ohio. 110 pp. \$2.00 single copy. Standard 3 hole binding. The author is a Tool Engineer with the Cleveland Pneumatic Tool Company, an instructor at the Cleveland Trade School, and a member of the American Society of Tool Engineers.

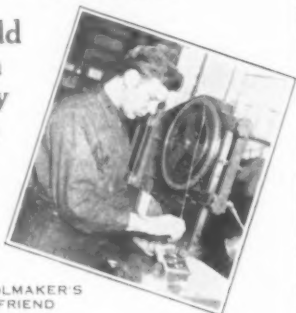
Starting with drafting terms, common trade terms, and abbreviations, this book is intended to present information on the subject of tooling and holding methods for drill jigs, fixtures, screw machines, and dies. Unnecessary data and long explanations have been omitted.

**THE TOOL ENGINEER**



**NO SAW WELDING  
INSTANT INTERNAL  
SAWING**

Should  
Be In  
Every  
Shop



THE TOOLMAKER'S  
BEST FRIEND

Unsurpassed in speed, efficiency and  
accuracy of sawing small and medium  
sized dies as well as miscellaneous parts.

Write or Wire for Details and Prices



W-S Standard Reamers  
with carbide tips. Ta-  
pered shank (illustrated)  
and straight shank  
types. Sizes: 1/4 to 1 1/2.

## Today's answer to MORE PRODUCTION

If you want to step up production as much as six  
times . . . cut down grinding time . . . and lengthen  
the service life of cutting tools . . . then switch to  
W-S cemented carbide tipped tools.

Each one is tipped with the correct grade of  
CARBOLOY best suited to do a cutting job on the  
metals for which the tools are ordered. (Other  
brands of carbide can be specified.)

You can expect and get uniform results with W-S  
tools. This is assured by our high standards for accu-  
racy and inspection. We *specialize* on cemented  
carbide tools *exclusively*. For this reason, we list as  
standard many tools formerly in the "special" class.  
Prompt shipment from stock on many types. Catalog  
142 sent FREE upon request. WENDT-SONIS COMPANY,  
HANNIBAL, MISSOURI.

Wire or phone your requirements and priority rating.



W-S Carbide Tipped  
Core Drills available  
in straight and tapered  
shanks. Sizes: 1/2 to 1 1/2.



W-S Carbide Tipped  
Centers available in  
Morse, Browne &  
Sharpe and Jarno Tapers.

**WENDT SONIS**  
CARBOLOY CUTTING TOOLS

CENTERS \* FLUTE DRILLS \* CORE DRILLS \* COUNTERBORES \* SPOT FACERS  
END MILLS \* REAMERS \* HOLLOW MILLS \* LATHE BITS \* SPECIAL TOOLS

**A LASALLE  
DESIGN**

Tool Designing

Machine Designing

Aircraft Tool Designing

Product Designing

Engineering Service

**LASALLE DESIGNING CO.**  
634 W. LAKE STREET, CHICAGO, ILL.  
Telephone MONroe 2345

(Continued from page 116)

his ideas have been accepted and put into practice. He has profited to the extent of \$2,580 in suggestion awards. How does he do it? By concentrating on one thing—the design of the instruments he assembles.

For sheer originality, one Westinghouse employee recently took top honors with his idea to divide an existing machine in half, and yet make it do 50 per cent more work. This man operated one end of a long machine

which cut and trimmed fin-shaped steel pipes that form a transformer radiator. The machine consisted of a long table with a turret die or cutting tool at each end. Each of the operators placed a radiator section on the table so that the turret dies could shape or flange the openings on one end of each section simultaneously. Then they turned the sections around to flange the other ends. Many of these pipe-like sections were 14 feet long and so unwieldy that the oper-

ator of one cutting tool had to wait until the other finished before he could perform his half of the job. Why not cut the machine in two, making each end a separate operation? Then each man could work steadily without interfering with the other. He submitted his idea and the cut was made. Production of the radiator sections was stepped up 50 percent.

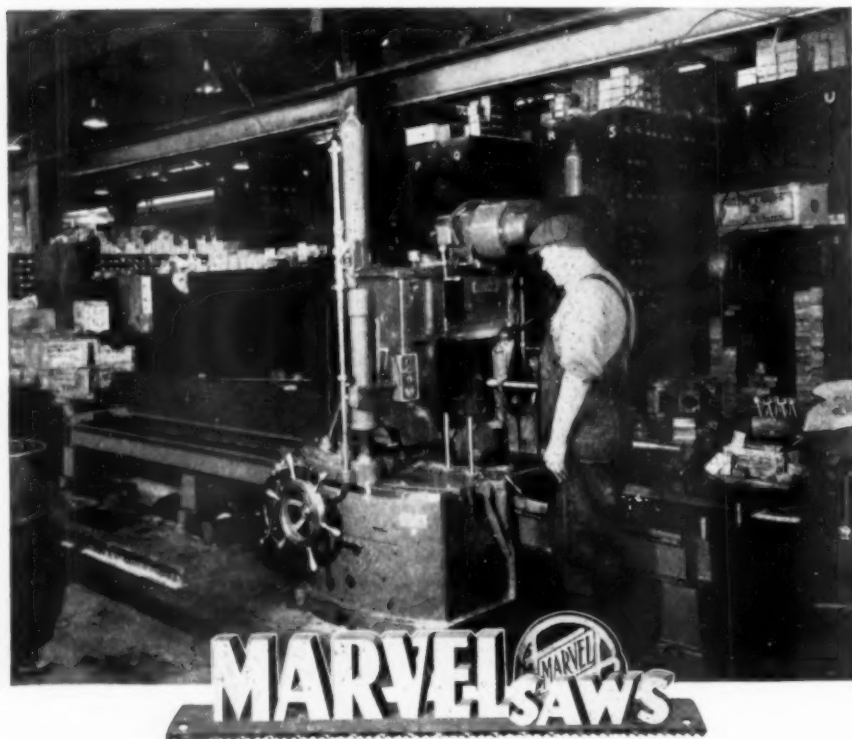
When you talk about stepping up production, an idea submitted by one of this electrical concern's workers must be placed near the top of any list. This was done in redesigning important gunsight lamps, half the size of a walnut. Used in delicate mechanisms for aiming big guns, they were made entirely by hand until one shop man suggested a new design so that it could be turned out on high-speed machines. Result? A 2,000 per cent increase in production.

#### New Men Contribute

Suggestions do not always come from employees long experienced in the work for which they propose an idea. In one new aircraft plant, the forming of Plexiglass panes for pilots or bombardier's enclosures is work suitable for women. Certain pieces, however, have irregular contours which require more than one worker to form properly. Since the heavier gauge material has a tendency to spring back to its original shape when cooling the sheet must be held down securely until it has set. As a result many panes were being rejected because they were poorly formed.

To overcome this, a new employee in the department suggested and designed a device which he called a "hold down". Similar to the female member of a draw die, it is made of the same material as the form, and resembles an open framework encasing the pane of plastic, making it conform perfectly to the contour of the form. With this device, one woman now turns out six times as many panes as three formerly did. The hot Plexiglass sheet is laid on the form, the hold down is placed over it, and remains there until the pane has cooled.

The Yankee mechanic has his dander up. That spells bad news for the Axis. American men and women are backing up their anger at Hitler and Hirohito with thousands of helpful contributions on the production front.



### Cuts Two 6" dia. Gear Blanks every 11 minutes

There are 12 MARVEL Saws at the Northern Pump Co., Minneapolis, some of which are in their tenth year of service. The Giant Hydraulic No. 18 MARVEL pictured above is a comparative newcomer in the Northern MARVEL family, having been installed just a few months ago, to speed up production on large work. When pictured, it was cutting-off gear blanks from 6" dia. S.A.E. 3120 hot rolled steel, two at a time, cutting-off two blanks every 11 minutes.

Whether you want thin slices or long lengths cut-off from flat or round bars, MARVEL Saws will produce more pieces per hour and will cut them off at lower cost per piece than any other machine or cutting-off method. Included in the MARVEL System are small inexpensive dry-cutting shop saws; heavy duty all-ball-bearing high speed hack saws (the fastest saws built); automatic production sawing machines that require no more operator attention than an automatic screw machine; a metal-cutting hand saw that saves hours of machining, roughing to size and shape; and a Giant Hydraulic Hack Saw, that cuts the toughest steel with ease. MARVEL High-Speed Edge Hack Saw Blades are positively unbreakable, can be safely operated at maximum speed and feed on any hack sawing machine.

Buy from your local distributor

**ARMSTRONG-BLUM MFG. CO.**

"The Hack Saw People"

5700 BLOOMINGDALE AVE.

CHICAGO, U. S. A.

Eastern Sales Offices: 225 Lafayette St., New York

## EVEREDE TWO-STEP BAR



The ONLY Boring Bar with the economical triangular bit.

Designed to use a larger bar diameter as the bit cuts ahead of the bar. This insures rigidity, making higher boring speeds and heavier cuts possible.

Everede Boring Bars are made of the finest heat treated nickel steel and each bar is furnished with six triangular high speed steel bits.

The Everede Boring Bar also permits the use of a solid stellite or carbide tool bit by clamping the bit in the "V" Type grip holding it firmly without danger of breakage.

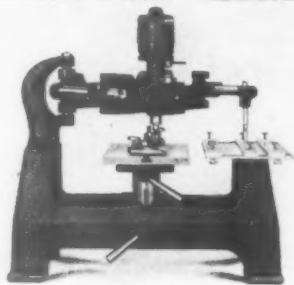
Write for Descriptive folder.

### EVEREDE TOOL CO.

WILLIS STUTSON

184 N. Wacker Drive Chicago  
Representatives in principal cities

## For Precision Marking In War Production . . .



## PANTO

ENGRAVER  
ACID ETCHER  
ELECTRIC MARKER

. . . 3 machines in one

A compact precision bench-type panto-graphic machine, with interchangeable heads . . . for engraving instrument dials, name plates, etc. . . and for acid etching or electrically marking tools and parts—heat-treated or annealed—on flat, concave, or convex surfaces.

Illustration shows machine with engraving head attached.

» Write for Literature

H. P. PREIS ENGRAVING MACHINE CO.

1810 SUMMIT ST. NEWARK, NEW JERSEY

## Greater PRODUCTION EFFICIENCY

WITH

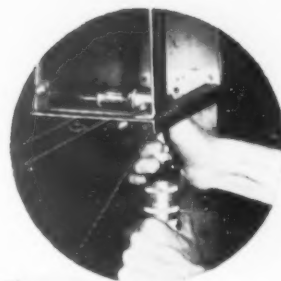


PNEUMATIC TOOLS

# New!



**3/8" CAPACITY AIR DRILLS**  
Both Straight and Right Angle  
at prices only slightly higher  
than 1/4" drills.



Here's good news for Defense Plants... Aircraft Builders... Ship Yards... and others who are interested in turning out more production with greater speed and less operator fatigue. Check the advantages of Aro Rotary Pneumatic Tools—power, rugged construction, simplicity of design, lightweight and stall-proof—with 3/8" Jacobs chuck at prices only slightly higher than for 1/4" capacity tools. We invite comparison.

Call your nearest ARO Jobber or write direct, outlining your delivery requirements.

**ARO EQUIPMENT CORPORATION**  
Bryan, Ohio

Pneumatic Tools • Lubricating Equipment  
Aircraft Products

## CHECK YOUR NEEDS NOW

- |                     |                 |                |
|---------------------|-----------------|----------------|
| ✓ Aircraft Drilling | ✓ Screw Driving | ✓ Filing       |
| ✓ Grinding          | ✓ Nut Setting   | ✓ Drilling     |
| ✓ Polishing         | ✓ Sanding       | ✓ Paint Mixing |

# A. S. T. E. DOINGS . . . . .



## Detroit

On the evening of August 14, the Detroit Chapter held its 3rd Annual Moonlight excursion. 1200 boarded the steamer Western States to take part in the festivities. Dancing and musical entertainment were features of the evening.

## Fond du Lac

Members and friends of the Fond du Lac Chapter gathered at the Takodah Club on Sunday, August 16, for their first Annual Outing. The program consisted of golfing and a buffet dinner. Mr. W. E. Rutz acted as master of ceremonies and gave away a great variety of prizes for both high and low golf scores.

## Los Angeles

Scully's Cafe on the night of August 13 was the scene of the Los Angeles Chapter meeting. Some 200 members and guests were present and, following the dinner, they saw a sound film provided by the Aluminum Company of America, entitled, "From Mine to Finished Product". Mr. Arthur J. Denis gave a talk concerning the use of proper cutting tools and materials for the machining of Aluminum (Dural) metal parts on a production basis.

CHIPS FROM A. S. T. E.  
NATIONAL HEADQUARTERS



Boulevard Temple Building  
A.S.T.E. National Headquarters.

Boeing paid a fine tribute to its TOOL ENGINEERS in a recent advertisement in a publication with national distribution. Probably you saw it. More than

half the page was given over to a picture of a new machine in use in their plants, for punching V-shaped slots in the circumferential stiffeners on the Flying Fortress. It was headed, "Shake Hands With The Octopus." Boeing says, of this machine, "Designed by Boeing Tool Engineers especially for high-production slotting and cutting of airplane stiffeners, this machine turns out parts forty-five times as fast as the machine which it replaced . . . It is another link in the lengthening chain of Boeing contributions to increased speed and efficiency in airplane production." We salute our nearly 11,000 members all of whom are so contributing to winning the war.

\* \* \*

Sometimes you may wonder what delays action on membership applications. Often it has been due to former operational difficulties at the National Office, but here is another side of it. We received four applications on July 15th from a Chapter where they had been held since February!

\* \* \*

If your mail is sometimes incorrectly addressed, please have patience. We have our problems and are solving them as rapidly as possible. Here is one that perhaps has caused some confusion. We have two members of the same name: JOHN EWING GILCHRIST. One is a Regional Director, formerly at Kewanee, Illinois, and a member of Tri-Cities Chapter—now is in the St. Louis territory. The other JOHN EWING GILCHRIST was originally a member of Peoria Chapter, then a member of Dayton Chapter, and now a member of Chicago Chapter. Only careful clerical workmanship can keep these straight.

\* \* \*

Does business take you to Washington, D. C.? Your problem of finding a room in which to sleep will be solved if you phone REpublic 2600. The Hotel and Transient Accommodations Bureau will find a place where you can rest your weary head.

\* \* \*

Harry Crump, Chairman of the Schenectady Chapter, has resigned and is now in Detroit with Carboloy. A special election in September will fill the position now held temporarily by Vice-Chairman J. L. Tocher.

\* \* \*

If you wonder "what's cooking" at the National Office, take a look at this report: During the five days beginning July 13th, 8,614 pieces of mail passed

through our mailing room. These included the packing, wrapping, addressing and stamping of 52 Society emblems, 125 binders (which had already been handled many times in the gold-stamping of names) for Standard Data Sheets; 4,100 double and single Government post cards; and 4,437 pieces of general mail. This is an average of more than 1700 pieces per day. Think of this in your one moment of relaxation and try to visualize the infinite amount of detail necessary to accomplish this end. Think of the checking of addresses (why not let us know when you move?), the inquiries which have been read and replies dictated. Think of the typewriter and mimeograph girl-hours which have made this possible. The week of the 13th of July was a good week, but not unusual.

\* \* \*

Howard F. Volz resigned as Secretary of Cincinnati Chapter, because of a change in employment. The Board appointed C. W. Stricker, of Auto Sun Products, Acting Secretary until September election.

\* \* \*

To serve you better and more speedily, the Board of Directors has purchased a bookkeeping machine. It will be in use when you read this. Work done by longhand for ten years is now being mechanized. Much of the system has been changed, new forms planned and printed, and a check of addresses of nearly 11,000 members has been made in order that the new operation may be put into effect.

\* \* \*

National Secretary Clyde L. Hause has received many letters of commendation for the recently-issued roster of Officers. Here are two quotes, "You are to be congratulated on this piece of work." "It is a fine piece of work and should be helpful in establishing better liaison between the various Chapters and the National Office."

\* \* \*

Received application for membership the other day from Charlie Burton, Production Manager for David Brown & Son (Hudd) Ltd., Huddersfield, ENGLAND . . . and a check for dues came from Hartwig Orenstein, 140 Queen's Park Drive, Glasgow, S.2, Scotland. What with other members in South and Central America, England, Sweden, France, Italy, and Australia, it appears that we are an International Society.

**LESS OPERATIONS  
AND FAR  
BETTER WORK  
WITH A**

**GATCO**

**ROTARY PILOT BUSHING**

Pilot and bushing fits with a **PUSH** fit, therefore a perfect bore

**ROUND-CHATTERLESS-  
SMOOTH**

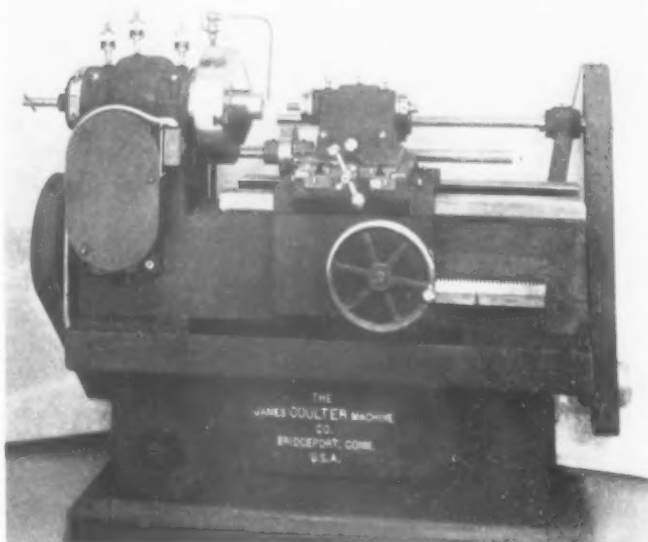


GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

Write for full information and prices

**GIERN & ANHOLTT TOOL COMPANY**  
1312 Mt. Elliott Avenue, Detroit, Michigan

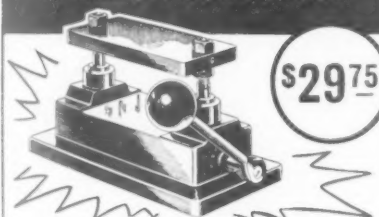
**PRECISION THREAD MILLER  
FULL AUTOMATIC CONTROL**



**INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS  
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT**

**The James COULTER Machine Co.**  
**BRIDGEPORT • CONNECTICUT • U. S. A.**

**CUTS TOOLING TIME  
SPEEDS PRODUCTION**



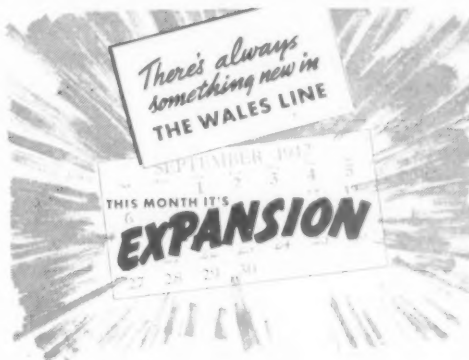
**\$29.75**

**THE UNIVERSAL VISE**

Gives you a ready-designed drill jig body that greatly reduces the tooling time and helps you get into production faster. You'll be amazed at its loading and unloading speed. Positive, quick action lever locks work instantly — holds securely — throw it back and work is released. No complicated adjustments. No costly drill fixtures needed — just a comparatively inexpensive drill bushing plate and adaptor for each job. Sturdily constructed thruout — nothing to get out of order. Pays for itself many times over. Only \$29.75 f.o.b. Chicago.

**ORDER TODAY**  
Include contract number  
or priority certificate

**MOHR LINO-SAW COMPANY**  
122 W. Union Ave., Chicago

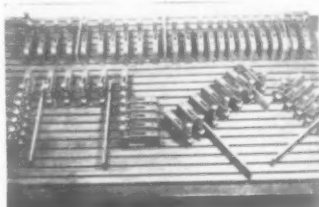


**A NEW PLANT . . . A  
NEW ADDRESS . . . NEW  
QUICKER DELIVERIES  
. . . MORE NEW WALES  
PRODUCTS.**

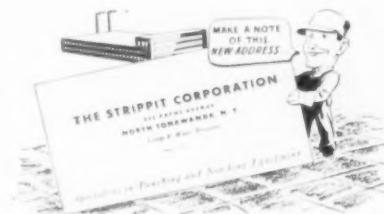
**CERTAINLY** — moving into a new, larger plant provides increased production and faster deliveries of Wales Punching and Notching Units to today's essential metal fabricating industries.

**AND** — when Victory comes, The Strippit Corporation will be ready with new ideas . . . new short cuts . . . new economies . . . new techniques . . . and **NEW WALES PRODUCTS** for your competitive peace-time conditions.

**REMEMBER** — There's Always Something New in the Wales Line. Keep posted by writing to —



Showing 3 set-  
ups of Wales  
Units one T-  
slotted plate.



Corporal Ira W. Franklin, Military P.O. No. 310, Six Repair Depot, Trenton, Ontario, Canada, was accepted into membership. If you have time, drop him a line. He is an interesting correspondent.

\* \* \*

A checkup of the one-day War Production Conference held in Boston, June 26th, under the joint sponsorship of twelve engineering groups, reveals 86 persons on the program. Thirty-six of these are members of A.S.T.E. There are twelve separate panel discussions listed. Of this number, six were manned

solely by A.S.T.E. members. A.S.T.E. is being called upon more and more for co-operation: LET'S GO!

\* \* \*

Don't forget your own WAR PRODUCTION CONFERENCE (the Semi-Annual Meeting) to be held in Springfield, Massachusetts, October 16-17. Frank W. Curtis, Chairman of the Committee in charge, is arranging a never-to-be-forgotten event. SAVE THE DATES.

\* \* \*

Headquarters is checking A.S.T.E. membership to determine present cor-

rect addresses. A return post card is being sent to each member. Please insert the requested information and return the card promptly.

\* \* \*

Many A.S.T.E.'rs are in the armed services. We need to have their addresses. The Executive Committee has decided that dues of such members will be suspended during the period of such service and, to the extent permitted, THE TOOL ENGINEER and other information will be sent to them. A special type of membership card will shortly be issued to them, sent direct from Headquarters. We need their addresses.

\* \* \*

To Chapter Officers—thanks for making certain that membership applications carry all the essential information. Such help on your part will save delays and embarrassment.

William B. Peirce has accepted appointment as Chairman of the Membership Committee. With lessening emphasis on quantity and increasing emphasis on quality, membership is still growing

\* \* \*

A new feature at the semi-annual meeting (War Production Conference) scheduled for Springfield, Massachusetts, October 16 and 17 (the banquet will be on the 17th) will be a school for Chapter Officers and Committeemen—an opportunity for them to learn how to do their respective jobs with less effort and greater accomplishment.

\* \* \*

National Headquarters has established a Speakers Bureau, is accumulating a raft of material on Speakers and available films. This material will be sent soon to each Chapter. We're trying to have it assembled in time to help in the preparation of Fall programs.

\* \* \*

Already at work as Chairman of the New Chapters Committee, Roy T. Branson has been checking several "prospects". Our members are pretty well scattered and are seeking the formation of new Chapters so that they may have the benefits of regular meetings.

\* \* \*

The First class in tool design, in Canada, sponsored by the War Emergency Classes, has just completed its first season under the direction of Doug Wright, a member of the Hamilton Chapter of the American Society of Tool Engineers. Commencing on October 15, 1941, this class for apprentice tool designers, draftsmen, and toolmakers, ran until March 30th. George Goldstein, Lloyd Sandham, and Alf. Goatley were among the instructors who helped Mr. Wright during the school year.

## HOW KENNAMETAL TOOLS *Reduce* 4 OPERATIONS TO 2

ORDINARY PRODUCTION  
SCHEDULE FOR FINISHED  
TOOL PARTS

1 ANNEAL  
2 MACHINE  
3 HARDEN  
4 GRIND

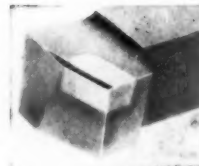
PRODUCTION  
SCHEDULE WITH  
KENNAMETAL

1 HARDEN  
2 MACHINE

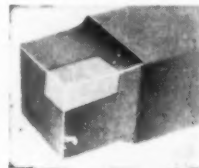
You can save 2 steps in machining steels hardened as high as 550 Brinell, by using KENNAMETAL tools. The great hardness and strength of KENNAMETAL enable users to machine steels quickly and economically **after** hardening. In addition, the smoothly machined surface obtained with KENNAMETAL often eliminates grinding operations entirely.

KENNAMETAL is economical in other ways, too. It removes more metal between grinds and more metal per tool than other carbides, thus reducing tool costs considerably.

Get the facts about KENNAMETAL. Write for a copy of the KENNAMETAL Vest Pocket Manual.



STYLE 21 TOOL



STYLE 3 TOOL

### HOW TO TAKE CARE OF KENNAMETAL Change Tools Regularly

Be sure you check tool wear carefully, so that tools can be changed before over-wear. Over-dulling destroys accuracy of work and reduces the number of grinds possible during the life of the tool. Save time and tools by regular sharpening.



KENNAMETAL INVENTED AND MANUFACTURED IN U.S.A.



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600 LLOYD AVE., LATROBE, PENNA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York  
Exclusive of Canada and Great Britain

## SALVAGE

A most honored word today. We have been giving it meaning, dignity, and prestige for 30 years, among users of cutting tools.



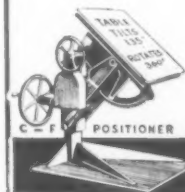
**NATIONAL TOOL SALVAGE CO.**  
3816 Beaubien St.,  
Detroit, Mich.

## Announcing 2 New Giant C-F POSITIONERS

Model 200 — 20,000 lbs. 20 inches away from table, 8 inches off center.  
Model 300 — 30,000 lbs. 24 inches away from table, 18 inches off center.

With push button control these giant C-F POSITIONERS (smaller one illustrated) rotate really large heavy and cumbersome weldments a full 360° tilts it to any angle to 135° from horizontal, moving thru both planes at once to save valuable minutes and hold in any position permitting strong, smooth, flawless down welding on all surfaces.

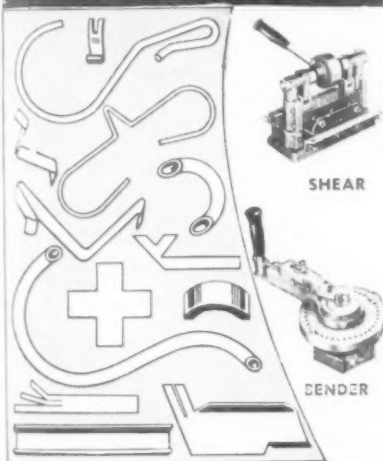
C-F Positioners comprise a complete line of pedestal mounted positioners from small (1200 lb.) hand operated models to these electrically operated giants.



Write for new Bulletin WP 22  
"Faster, Better and More Economical Welding."

**CULLEN-FRIESTEDT CO.,**  
1318 S. MILWAUKEE AVE. CHICAGO, ILLINOIS

## DIE-LESS DUPLICATING



SHEAR

BENDER



BRAKE

The parts shown are typical of the great variety of simple or intricate forms and shapes which can be quickly duplicated to a tolerance of .001" with DI-ACRO Precision Machines — Shears, Brakes, Benders. For experimental and research work or production runs, DI-ACRO Units form angle, channel, tube, rod, moulding, wire, strip stock; shear stock sheets, trim duplicated stampings. With DIE-LESS DUPLICATING, die expense and time delay are frequently saved.

Send for 32-page Catalog—  
"Metal Duplicating Without Dies"

O'NEIL - IRWIN MFG. CO.  
307 - 8th Ave. S.,  
Minneapolis, Minn.



## USE DUB LIFE \* PLUG GAGES FOR TWICE THE LIFE

\*REG. U.S. PAT. OFF.

**"UPPCO" LAPPED**  
**THE LAST WORD IN FINISH!**



Complete in every detail, this set of 471 plug gages with a mahogany finished cabinet! In sizes from .030 to and including .501, these plug gages are single end, plain limit, with ends reversible. Six "easy-to-move" cabinet drawers on rollers for the gages. The cabinet has a receding door which can be locked when not in use.

**"PLUG GAGE SPECIALISTS"**  
**UNITED PRECISION PRODUCTS CO.**

4617 W. HURON STREET

CHICAGO, ILL.

## Handy Andy Says—



**F**IRST off, I want to pay my respects to Walt Pohle, Supt. of Spray Engineering Co., for a darned good idea. Not that I'll use it as is, but it suggests an improvement to a job I've been wrasslin' with these many hours.

I'm referring, of course, to his Drilling, Reaming and Spotfacing tool, described in August TOOL ENGINEER. Thanks, Walt!—I'll show you mine (if it works) only, I'm going to sell it to the Crib and collect 5 bucks. Which is a roundabout way of getting to the point that there's ten thousand strong Tool Engineers in this man's outfit and we want ideas for the Crib. If you haven't got time to make a drawing, then make a sketch. And if you can't type, or get on the good side of the Steno, then write it longhand—we'll guess what we can't read like the boys in the home office do with my stuff. Come now, one and all!—show that Yankee ingenuity.

## Accurately machined for mounting as well as for performance



### on **(T-J)** Hydraulic Cylinders...

- The mounting surfaces are parallel with (or at right angles to) the bore of the cylinder.
- All surfaces are as square and smooth as is warranted.
- All mounting holes are drilled — not just cored.

This workmanship makes for better installation, admirable appearance on the job and what is better yet, of course, insures a longer life of more efficient performance. Catalog sent upon request.

## THE TOMKINS-JOHNSON CO.

624 NORTH MECHANIC STREET

JACKSON, MICHIGAN

180

Speaking of Yankee ingenuity reminds me that we've a month to go, then, the Semi-Annual in Springfield. Don't know what Frank Curtis and his gang have lined up for us, but I know it's going to be good. Eh, Frank? Me, I'm all agog, a/c taking a vacation that week, which gives me time to ramble a bit. Haven't trod New England soil since '22, when I started Westward Ho in a Ford T. Really had California in mind, but somehow Detroit's dynamic tempo got me. Which reminds me that Jack Marvin of L. A. breezed into town t'other day, exuding California sunshine and the aroma of orange blossoms. Had a young fellow—George DeHart—in tow, and they called at the plant, Jack having a line of machinery that intrigued my interest. That evening, having had business down town, I was hightailing for my car when I caught up with the twain, sight seeing. That, of course, called for a Scotch, which primed the boys for broader vistas. Unfortunately or otherwise, I've never been in a night club (unless the Alpine Village in Cleveland is one) and I just don't know that "spots". So, I took 'em for a ride around Belle Isle, and the boys said they enjoyed it immensely. Me, I enjoyed their company.

Had a letter from Steve Urban of Syracuse, commenting on the homely philosophy etc. in the Column. Thanks, Steve! — a li'l encouragement goes a long way, especially for an amateur philosopher. Among other things, I was invited to speak at a Syracuse Chapter meeting, which invite I'm accepting, making it Oct. 13, which should be the Tues. before the Semi-Annual. I'm telling you this by way of advance publicity (you see, I have to toot my own horn) so as to make sure somebody'll be there except Steve and his fellow Chapter officers. A prophet away from his home town, eh?

Also had a letter from A. C. Barlow of Chula Vista, Cal. (publicizing for San Diego) who implies that he'd like more of California in the Chapter news. As for that, I've no doubt that all of the "57" want their place in the sun, and we play no favorites. But look here, You meet, you eat, and you have a speaker, who maybe said the same thing at some other Chapter meeting and it's already been published. But what's new? Give us that, and we'll season to suit the most expensive taste. It's not enough that you give us the routine resume of a meeting, which read more or less alike. Except, of course, Toronto or Hamilton, I forget which, having mislaid my notes. Anyway, one or the

THE TOOL ENGINEER

## U S HEADS STANDARD SINCE 1915



30 DIFFERENT STANDARD SIZE  
ADJUSTABLE DRILL HEADS,  
CAPACITIES UP TO 1½" DRILLS

**SEND US YOUR B/PS**

*All Types of Fixed Center Heads*

**UNITED STATES DRILL HEAD CO.**  
Cincinnati, Ohio

## HIGH SPEED TAPS

NOW ON CRITICAL LIST.  
KEEP THOSE NOW IN SERV-  
ICE 100% EFFICIENT BY  
PROPER SHARPENING.



THIS NO. 12 GRAND RAPIDS  
TAP GRINDER MAKES THE  
JOB A SIMPLE ONE.

*Bulletin on request*

**GALLMEYER & LIVINGSTON CO.**  
110 Straight Ave., SW  
GRAND RAPIDS MICHIGAN

## SEVEN MEN INSTEAD OF TEN

The Ransome Welding Positioner illustrated effectively positions heavy awkward pieces such as that shown. The time saved in this particular installation permits seven men to do the same amount of work ordinarily requiring ten men without the use of the Positioner. "Impossible" positions are conveniently and securely established for efficient speedy welding operations. Write for literature.

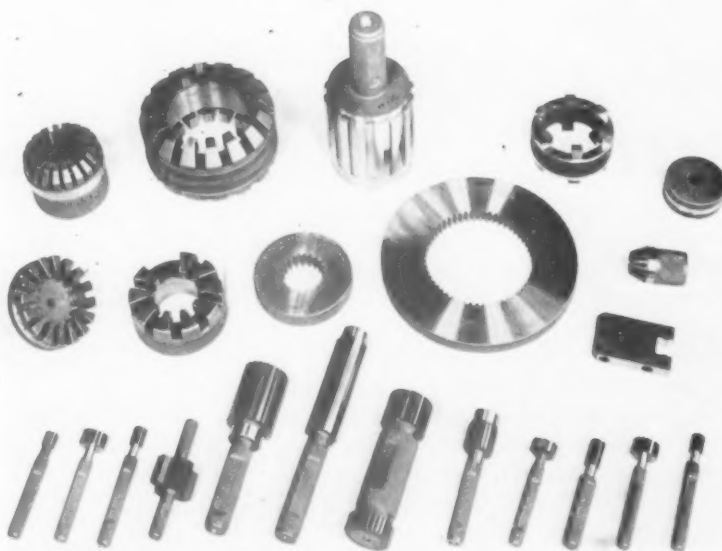


The unit shown is one of several installed at the plant of the York Safe and Lock Company, York, Pennsylvania.

**INDUSTRIAL  
DIVISION**

**RANSOME MACHINERY COMPANY**  
Dunellen, New Jersey

## SPLINED GAGES by *Amco*



We are now in volume production manufacturing Precision Straight Side Serration, Involute Male and Female Splined Gages. We have a complete Spline Engineering Service for your convenience. May we have the pleasure of quoting on your requirements?

**AMCO GAGE COMPANY**  
19760 West Eight Mile Road Detroit, Michigan

other sent in the most detailed report I've yet to read; the House of Lords in Parliament convened could have done no better. But, give us personalities, so that Jack White down in Texas can thrill at seeing Jean Le Blanc up in Montreal in the news, and vice versa. The Chapter news can only be as good as the individual publicity men make it.

From one thing to another, I was invited to a beefsteak party a while back, the host of which — Donald G. Babbit of Detroit—had decided to return to the soil via the gentleman farm-

er's route. That is, rustivating out in the lake country. The guests included Andrew Hotchkiss, local manager for Hickler Bros. of Saulte Ste. Marie, George E. Schenck, Frank J. Ortman, Fred J. Zoellin, F. C. Gallaudet and Lt. Comdr. Ernest L. Johnson. Some of you will no doubt meet old friends among them. Anyway, the group comprising engineers, former star athletes and ex-bankers and ex-lawyers who have forsaken the bar and the till to better serve Uncle Sam, I got quite an education along with a grateful respite from

this headache that is war production. I just relaxed, enjoyed good food and interesting conversation; I learned, among other things, that the best way to stave off inflation is to buy War Bonds. Good idea, that. But what I started to say was this: During the introductions, a name clicked, Gallaudet...? "Any relation to the Gallaudets of East Greenwich, R. I.?" And sure enough, 'twas the son of the Rhode Island pioneer in aviation! I think the name is familiar to some of you Yankees. Remember smiling Jack McGee, auto racer and pilot for Gallaudet, who crashed in Narragansett Bay — oh, sometime around '16? His kind pioneered what is destined to be American air supremacy.

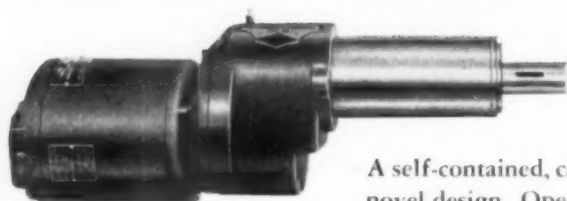
New Englanders, you know, are famous for their Yankee ingenuity. Their fame is deserved, and personally, I could write a volume on their mechanical gumption. But right now, I'm going to pay posthumous tribute to A. J. Langelier, in his time president of Langelier Mfg. Co. Coming back to Providence shortly after the sinking of the Lusitania, I braced him for a job. A. J. looked me over. "What can you do?" "Well," glancing around, "Most anything I see being done around here". He puffed at his stub of a pipe. "Cocky, huh! All right, my *bon homme*, we'll see if you can design automatic machinery". It happened that I could, although A. J. demanded everything a man had. Designing and building special machinery, he'd tackle anything, revelling in the "impossible" — a born Tool Engineer. But oh, was he temperamental!

Through some accident, he had lost the end of his right index finger, and when pointing out some detail in design, the stub would fall about an inch or so short of the objective. "No, not there. There!" It was all very confusing until one day, in exasperation, I pinned his finger to the paper and drew a circle around it. "There?" "No," grinning and taking the pencil, "here". We'd quarrel heatedly over a design, only to wind up happy and smiling when a tough job had been licked. Production! A. J. considered the day lost when he couldn't double the production possibilities of a special machine. "If they demand a hundred pieces an hour, give 'em a machine that'll produce two hundred", was his slogan. And we need that spirit and vision now, need it badly. Oh, he was hot tempered but fair, temperamental but endowed with genius, a fine engineer and a versatile mechanic. Of such timber is the American Tool Engineer hewn.

A. E. Rylander.

THE TOOL ENGINEER

## Rehnberg-Jacobson DRILLING OR TAPPING UNITS

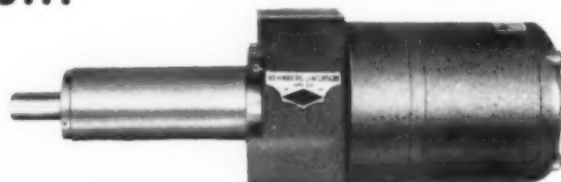


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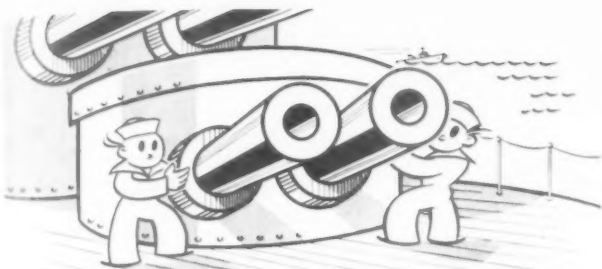


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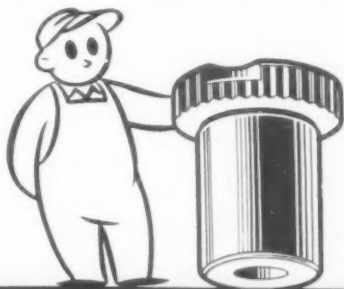


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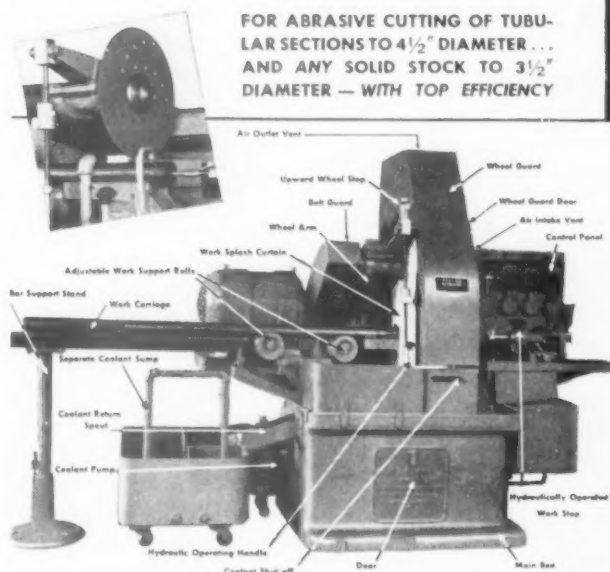
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# NEW LITERATURE . . . . .

Of Interest to Production Executives



**(487) Machine and Cutting Tools**

*Ex-Cell-O Precision Machine Tools and Cutting Tools.* 20 pp. Ex-Cell-O Corporation, Detroit. This new catalog gives the complete specifications on the entire line of precision machine tools, cutting tools, and related products manufactured by this concern. Each machine and tool is illustrated and described and, in many cases, the work accomplished

by the machines is illustrated and described.

**(488) Plug Gages**

*Dublife Plug Gages for Double the Life.* 12 pp. United Precision Products Co., 4618 Huron Street, Chicago. An introduction on the importance of plug gages is a feature of this new catalog. Each type of gage is illustrated and the

handle size, size range, general dimensions, and prices are given. A chart of decimal equivalents is included and a special cabinet for the complete set of gages is shown.

**(489) Cutting Machine**

*Keep 'Em Cutting.* 8 pp. Andrew C. Campbell Division of American Chain and Cable Company, Inc., Bridgeport, Conn. Describing the Campbell Model No. 425 Cutalator abrasive cutting machine, this new booklet brings out, by means of line illustrations, the various features of the machine. It shows the cycle of simplified operation and illustrates the different shapes and the types of materials that can be cut. Other Campbell machines are shown and briefly described.

## INFORMATION FREE

To receive booklets listed in this section, place key number of desired literature on postcard on page 147 and mail to **The TOOL ENGINEER.**

**(490) War Industry Machines**

*Delta Tools the Machine Guns of Production.* Delta Manufacturing Company, 600 E. Vienna Avenue, Milwaukee. This new booklet illustrates and describes many time-saving adaptations of machines to all branches of the armament program. Actual shop photographs show drill presses, grinders, cut-off machines, abrasive finishing machines, and circular, scroll, and band saws in action. It shows special set-ups said to be developed at low-cost, batteries of drill presses operated by women and unskilled labor, and short cuts said to be possible with these machines.

**(491) Welding**

*Progressive Standardized Seam Welders.* Progressive Welder Company, 3050 East Outer Drive, Detroit. This bulletin covers the design and the operating features of light, medium, and heavy duty seam welders. Available in three styles—for transverse welding, for longitudinal welding, and for both types—these machines are illustrated at typical work. The bulletin also gives specifications tables and drawing showing major dimensions of the standardized machines.

**(492) Electronic Control**

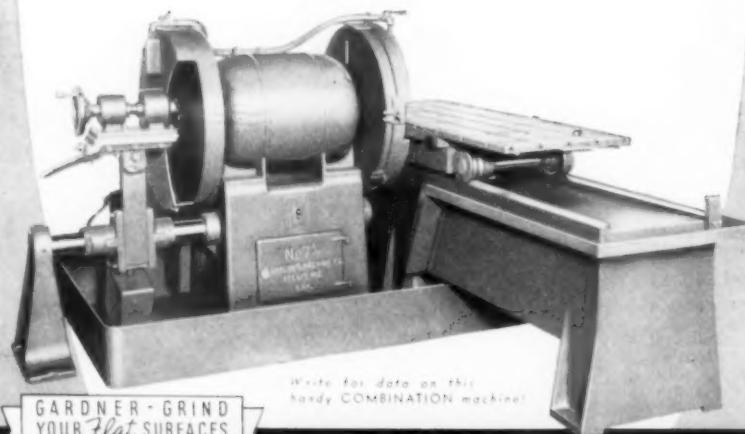
*Electronic Control for Resistance Welding.* 38 pp. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. This new booklet gives

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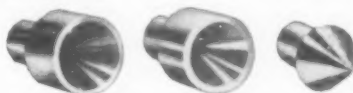
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#### (493) Lubrication

*Lubrication of Cincinnati Milling, Grinding, Broaching and Lapping Machines.* 56 pp. Cincinnati Milling and

Grinding Machines, Inc., Cincinnati, Ohio. Specifically designed for the users of this concern's machines, this catalog gives detailed information on lubrication which is considered especially important on hydraulically actuated machines. Instructions and corresponding diagrams are given for each machine, the instructions being based on an eight-hour day. An introduction and complete table of contents are included in this booklet.

#### (494) Molten Salt Baths

*Molten Salt Baths for Heat Treat-*

*ment and Case Hardening of Steel.* 72 pp. E. I. du Pont de Nemours & Company, Wilmington, Delaware. This manual describes case hardening of ferrous metals in baths containing sodium cyanide, use of simple cyanide baths as reheat media for high carbon and oil hardening alloy steels and for carbonized work, and nitriding of high-speed steel and other high alloy tool steels in molten cyanide baths. Also included in the booklet is information on salt bath equipment, cyanide disposal, modern analytical methods, and safety in operation.

#### (495) Lathes

*The Care and Operation of a Lathe.* 106 pp. 50c. Sheldon Machine Co., Inc., Chicago. Primarily written for use with Sheldon Lathes in government training and trade schools, this manual is for the beginner and is designed to instruct him in how to take care of and to operate a back-geared, screw cutting precision lathe. Pocket sized, the manual contains the "do's and don'ts" of this type of work, is illustrated, and is said to contain a complete line of tool grinding charts. It mentions the oiling and proper care of a lathe, the grinding of cutters, modern lathe tools, holding the work, and the performance of basic lathe operations.

#### (496) Vise

*Speedy Air Vise.* 2 pp. W. R. Brown Corporation, Chicago. This piece of literature describes and illustrates a new vise that is pneumatic and foot controlled. Specifications, additional features, and prices are listed. It is shown under actual working conditions.

#### (497) Salt Bath Furnaces

*Heat Treatment in Ajax-Hultgren Electric Salt Bath Furnaces.* 20 pp. Ajax Electric Company, Inc., Philadelphia. Completely illustrated, this booklet shows modern installations of the immersed electrode salt bath furnace with the self-circulating, self-heating feature. This is said to be for all the key heat treating processes, including the hardening of high speed steel tools, carburizing, neutral hardening, heat treating aluminum alloys, selective heating, annealing, brazing, and armament applications. Operating principles are discussed, standard sizes are shown, as well as mechanized and manual types in general use.

#### (498) Grinding

*A Practical Guide for Grinding Rifle Drills.* 12 pp. W. F. & John Barnes, Rockford, Ill. This book is offered as a guide for practical shop men who have been called upon to produce rifle barrels.

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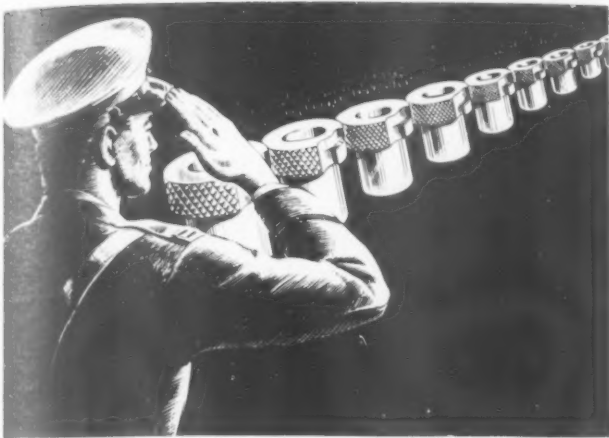
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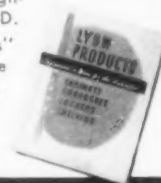
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#### (499) Lathes

*16 Inch South Bend Precision Lathes.* 8 pp. South Bend Lathe Works, South Bend, Ind. This catalog illustrates and describes the South Bend 16 inch tool-room lathe and the 16 inch quick change

gear lathe. The catalog illustrates the construction features of the lathe and tabulates the specifications for ready reference. Also listed are the attachments, accessories, and tools for use with these lathes.

#### (500) Automatic Press

*Faster Production with Diebel High-Speed Press.* 4 pp. Diebel Die & Mfg. Co., 3651 Lincoln Avenue, Chicago. A feature of this folder is a chart which shows the typical steel and non-ferrous materials that can be blanked on this press. A large illustration of the press

which has the parts for reference to descriptive material is included. Various photographs show many of the working parts of the press.

### INFORMATION FREE

To receive booklets listed in this section, place key number of desired literature and your name and address on postcard on page 147 and mail to THE TOOL ENGINEER.

#### (501) Tapping Machines

*Haskins Highspeed Tapping Machines.* 24 pp. R. G. Haskins Company, 2756 West Flournoy Street, Chicago. Full of illustrations on the different tapping machines, their parts and work, this bulletin gives the complete specifications and describes the Haskins air control. Other pages show the details of construction of the tap head, holding fixtures for the machines, dial feed fixtures, and the actual work with the right machine and fixture combination.

#### (502) Cutting Tools

*Genesee Cutting Tool Catalog.* Genesee Tool Company, Fenton, Michigan. Covering a complete line of cutting tools, this catalog not only lists and illustrates sizes of standard tools available, but also shows a large number of group photographs of special tools which the company is equipped to produce. It also contains a number of tables covering standard items such as standard keyways for cutters, dimensions of Morse and B & S taper shanks, and weight per inch of round bars.

#### (503) Drills

*Sensumatic Drill Head.* 4 pp. Michigan Industrial Sales Co., 132 Duffield, Detroit. This folder shows the drill head in various multiple set-ups. The features are described and the capacities given. A sectional drawing of the drill head is included and the numerous parts pointed out.

#### (504) Tap Reconditioning

*Tap Reconditioning Wall Chart.* Detroit Tap and Tool Company, 8432 Butler Street, Detroit. Now available, this wall chart gives instructional details as to recommended methods of sharpening various types of taps including taper, plug, bottoming and spiral pointed types. Designed to be hung near the tap reconditioning machine, this chart contains instructions which show the correct number of threads to be ground for chamfering each tap type as well as the angle to which the various tap chamfers should be ground.

#### (505) Torque Wrench

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Stock per side 1/16"  
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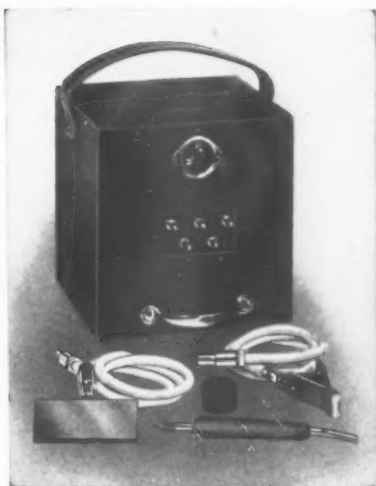
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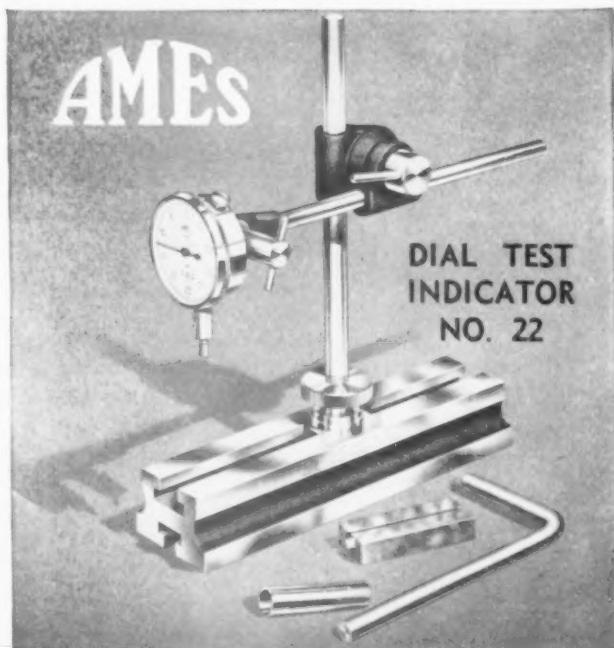
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6 pp. P. A. Sturtevant Company, Addison, Ill. This folder is made up of excerpts from an article by A. Brunelle, Service Tool Engineer at the Wright Aeronautical Corporation. Several illustrations show the actual use of the torque wrench in setting cylinder hold down studs on the Wright Cyclone 14 engine.

**(506) Diamond Tools**

*The Diamond World.* 4 pp. Christensen Diamond Tool Company, 3683 East Willis, Detroit. A new mechanical proc-

ess of placing the diamond in tool holder called "Brostitute" is explained in this folder. Also included in the folder are facts about industrial diamonds and a map showing the diamond regions of the world. Specifications and illustrations are given for both the group mount and the cluster type. Information is also given on form and radius dressing tools.

**(507) Motor Tool Kit**

*Dremel Electrical Appliances.* 6 pp. Dremel Manufacturing Company, 14th & Clark Streets, Racine, Wis. This

folder describes and illustrates a hand-held, motor driven tool said to do many jobs such as grinding, drilling, carving, routing, and polishing. The complete kit with its many attachments is shown and many features of the outfit are listed. Many grinding, cutting, and other attachments for the tool are catalogued and the illustrations, prices, and specifications of each are given.

**(508) Power Press**

*General Flexible Power Press.* 4 pp. General Manufacturing Company, Detroit. Just released, this new folder describes and illustrates the 8-ton General flexible power press. The mechanical operation of this press is shown by a sectional drawing with the various parts pointed out. Specifications are included as well as a description of the uses and advantages of the press. General shaft straightening attachments are also mentioned.

**(509) Steel**

*Cold Rolled and Cold Drawn Specialty Steels.* 12 pp. Crucible Steel Company of America, 405 Lexington Avenue, New York. This booklet contains descriptions and illustrations of the various steels under this classification. Numerous charts are given which list such things as approximate weight in pounds per 1000 feet, approximate relations between hardness numbers, and thickness gage numbers.

**(510) Tool Holder**

*Save Machining Time and Reduce Tool Inventory with the Elk Universal Toolholder.* 8 pp. Elk Tools, Inc., 51 West Broadway, New York. A feature of this folder is a line diagram which shows typical set-ups for lathe work. Sizes and prices are listed. The holder is described and illustrated. Tool bits, boring bars, and threading tools are also mentioned.

**(511) Production**

*Building Production Morale.* 40 pp. Northern Pump Company, Minneapolis, Minn. This booklet is a pictorial record of this company's war production operations and morale methods. Explained fully are the methods used by the management, the workers, and the naval personnel to drive the plant fully two years ahead of contract schedule. It contains over 100 pictures taken inside the plant.

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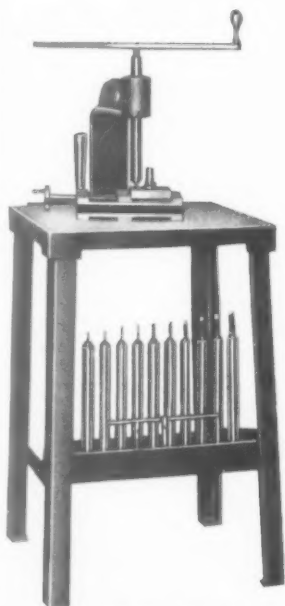
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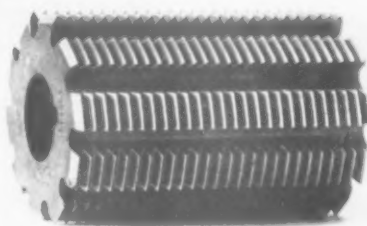
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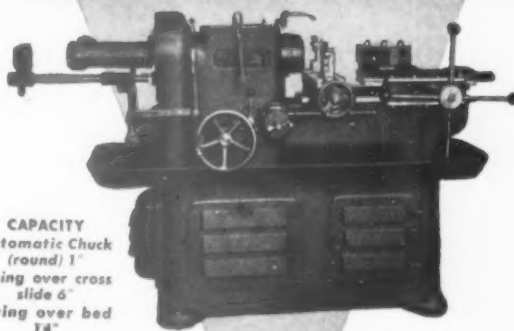
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Self-Locking Turret and Infinite Spindle Speeds



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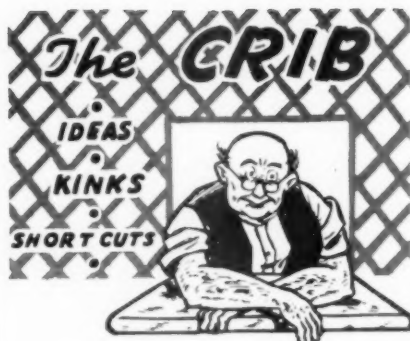
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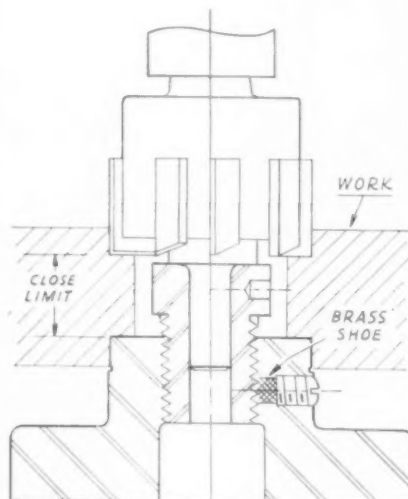
#### THE DOALL COMPANY

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#### Between Shoulder Counterboring

The counterbore shown embodies the advantage of between-shoulder dimensions that can be accurately maintained without stop collars against the work. As is indicated in the drawing, the opposite counterbore rests on a locative plug, which also contains a vertically adjustable bushing. The



shouldered pilot stops against this bushing, hence, there is no marring of the work, nor variations should the top surface be rough.



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(Continued on page 194)

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Here's why Procunier Tapping Heads give

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The exclusive advanced design of the new Procunier Tapping Heads assures you accurate tapping at high speeds with automatic protection for taps! Tap is driven by a double-cone, cork-faced friction clutch which automatically regulates tap driving power by pressure applied through the drill press spindle. Operators can quickly detect dull or loaded taps by the "feel", or pressure on the clutch, required to drive them thus avoiding needless tap breakage. With this sensitive Procunier smooth-operating friction clutch, bottom tapping is as simple as through tapping, since the clutch instantly slips should the tap strike bottom or stick due to tap loading.

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Standard Procunier Tapping Heads can be equipped for external threading. Produce accurate work and increase output.

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giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs.



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• As carefully made as the finest tool. Accurately balanced malleable iron heads on straight grained and polished hickory handles. Replaceable genuine Java Water Buffalo Rawhide faces which will not chip, shear, or split, providing a striking surface that is smooth and accurate to the last blow.

Cat. No.	Diameter in inches	Weight in pounds
0	1	1 1/2
1	1 1/4	1 1/8
2	1 1/2	1 3/8
3	1 3/4	2 1/4
4	2	4
5	2 1/4	5 1/2

These are the tough, resilient, long-lasting Rawhide faces made from specially treated Java Water Buffalo hide for use in Chicago Rawhide Hammers.



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• Chicago Rawhide Mallets have solid, hard rolled Java Water Buffalo Rawhide heads securely glued and riveted, fastened to hickory handles with steel forged pin. A tool that is finely balanced for accurate blows, made for long service and safe to use.

Not Loaded			
Cat. No.	Diameter Inches	Length Inches	Weight Ozs
0	1	2 1/2	2
1	1 1/4	3	3 1/2
2	1 1/2	3 1/4	6
3	1 3/4	3 1/4	7 1/2
4	2	3 1/2	10
5	2 1/4	4 1/4	21
6	2 3/4	4 3/4	23
Loaded Mallets			
7	1 1/4	3	8
8	1 1/2	3 1/8	12
9	1 3/4	3 1/2	16
10	2	3 1/2	20
11	2 1/4	4 1/4	42

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JKS resinoid-bonded Diamond Wheels for internal grinding of tungsten steel cartridge dies, produce straight holes of mirror-like finish, accurately, speedily and economically. Roughing and finishing wheel diameter 7/16 in.; length 3/8 in.; bore 1/8 in. Special sizes to order. Consult a JKS representative or write for folder.

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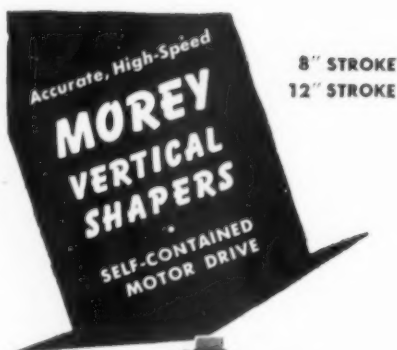
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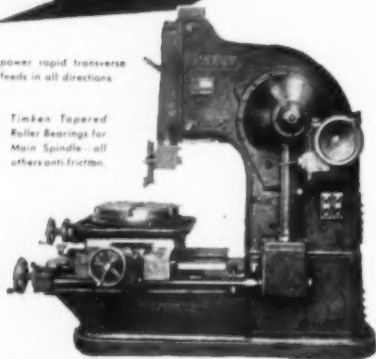
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8" STROKE  
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power rapid transverse feeds in all directions

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Built to highest accuracy standards the MOREY VERTICAL SHAPER is simple for tool-room manufacturing. Power feeds and power rapid transverse feeds in all directions are instantly available in all operating positions.

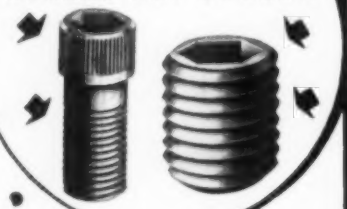
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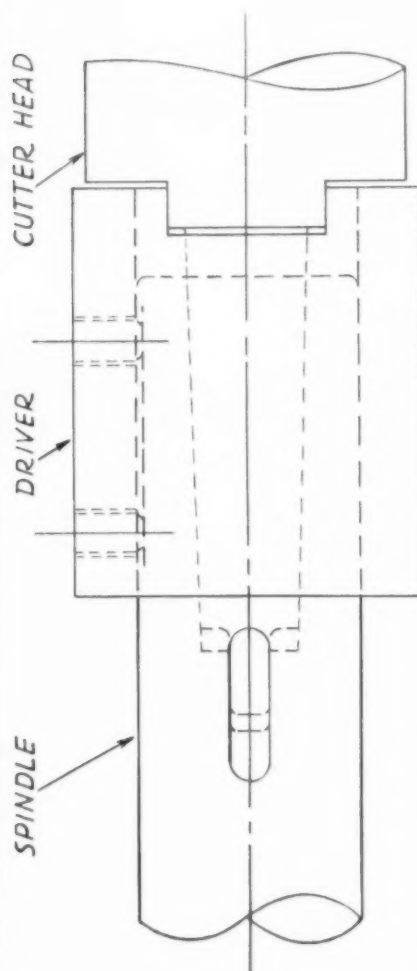
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PRECISION DIE  
SETS**

(Continued from page 192)

### Auxiliary Drive for Tanged Tapers

An annoying feature about conventional tanged taper drives is that the tangs twist off, often rendering valuable tools useless until reclaimed. And while several adaptors are on the market, they provide relief rather than cure, are not preventives. The auxiliary driver shown takes the load entirely off the tang and, — driving from a larger diameter — insures cuts and feeds not possible with tanged drives.



As shown, a collar, bored to the caps (O.D.) of the spindle, is held by set screws, keys or a pin lock, and the drive is taken by a milled slot. It is recommended at a time when tool conservation is vital.

### Counterbore for Inside Opposed Holes

The counterbore shown here has the advantage of quick grip and quick release, with the alternate feature of depth gaging. That is depth of coun-

(Continued on page 196)

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WHEN YOU READ THIS  
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*Rotorex* GRINDER  
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Because they are correctly designed and balanced and are drop forged from tough open hearth steel, heat treated to extreme stiffness . . . because they have alloy steel screws that are hardened at the point to prevent up-setting, and have

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SEPTEMBER, 1942

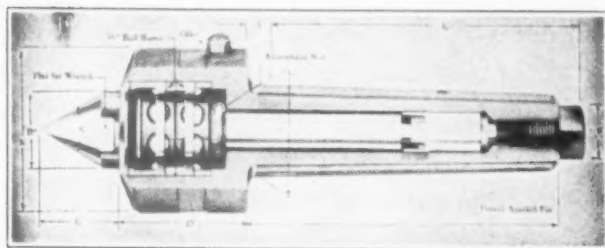
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LOAD CAPACITY—200 TO 40,000 LBS.  
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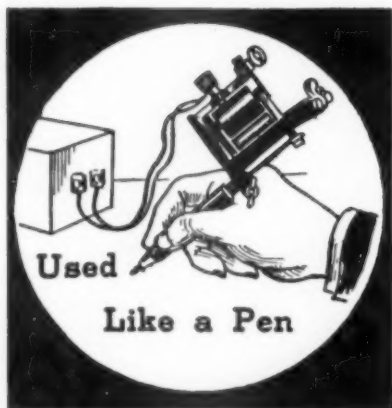
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P3 models are available in external right or left discharge types, flange-mounted and immersed models.

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LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS



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(Continued from page 194)

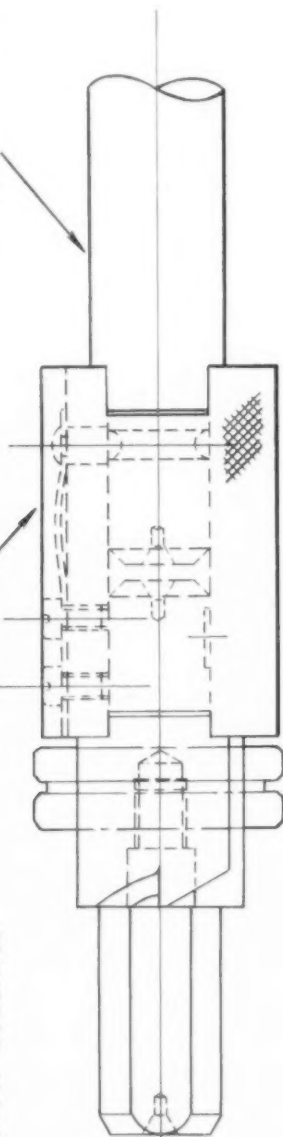
terbore can be determined by the pilot bottoming against a stop; or conventional stop collars can be used on the holder body.

In operation the pilot is dropped into the hole, and the driving bar brought down until the ball plunger snaps in. In withdrawal, the bar is simply pulled out of the body by the return stroke of the spindle. The tool has worked well on production.

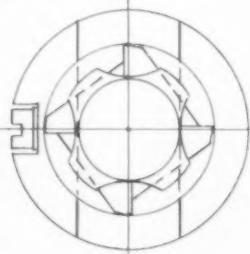
TAPERED OR STRAIGHT  
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FLAT SPRING

STOP HERE, OR  
WITH COLLARS



COUNTERBORE FOR OPPOSED INSIDE HOLES



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SEPTEMBER, 1942

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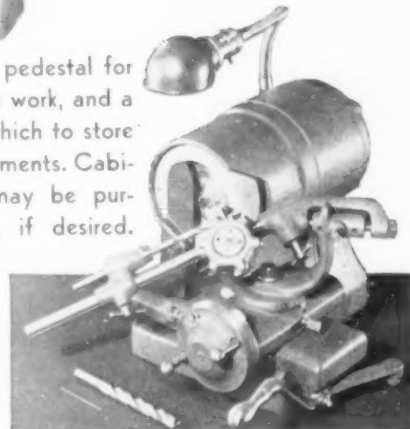
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Sellers No. 1G  
Drill Grinder  
with steel cabinet  
pedestal



A firm, substantial pedestal for the grinder and the work, and a handy cabinet in which to store supplies and attachments. Cabinet and grinder may be purchased separately, if desired.

The Sellers Model 1G Drill Grinder will grind drills from No. 70 (.028") to  $\frac{1}{2}$ " and produces accurate drill points of 160 to 65 degrees included angle — perfect drill points with equal identical lips. Speeds production. Saves skilled labor for production machine work. Saves drills. Write for catalog and prices.



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*H. K. CLARK*, vice president and general manager of Norton Company is now a Lieutenant Commander in the Navy and a member of the Army and Navy Munitions Board. *COMMANDER CLARK* previously spent nine months with the OPM and WPB, lastly as assistant deputy director of the Division of Industry Operations.

*COMMANDER R. E. W. HARRISON* after serving a little more than two years as a staff officer in the offices of the Assistant and Under Secretary of the Navy, has been released from active duty to devote his efforts to the provision of the basic tools required to produce urgently needed planes. *HARRISON* formerly was chief engineer of

one of the largest machine tool companies in the United States, later chief of the machinery division of the U. S. Department of Commerce, and then vice president of the Chambersburg Engineering Co., also holding a similar office in the consulting engineering management concern of Clarke-Harrison, Inc. of Philadelphia.



## **GAP GAGE GRINDER FOR GRINDING OR REGRINDING GAP AND SNAP GAGES...**

This machine is precision-built for the special purpose it is designed to serve—grinding, regrinding or lapping of gap and snap gages from .050" to 23" between faces. It is easy to set up, handy to operate, and will do extremely accurate work. Previously inexperienced help can be trained in a relatively short time, and the machine can also be used for various types of work other than gage grinding.

Lacking space here to give full specifications, we urge that you write for circulars or see one of our representatives for further interesting details.



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AND  
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CO.**

**NY-LINT TOOL & MANUFACTURING CO.**  
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Works Manager for Le Maire.

*H. W. ANDERSON* and *M. J. RICE* have been promoted to vice presidencies of the Aviation Division and the Quickwork-Whiting Division respectively of the Whiting Corporation, Harvey, Illinois.



**F. M. HOEFLER**  
Elected to new position.

*F. M. HOEFLER* has been elected vice president and general manager of the Harvill Aircraft Die Casting Corp.



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... every operation — boring or  
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The B&B Spotfacer and Boring Tool is now widely recognized as one of the most indispensable tools in the shop.

Blade is set accurately and quickly by means of micrometer adjustment on head. It will bore diameters up to 22 inches — square and flat — and with adapters, will bore, bottom, or face holes as small as 3/32 in. Adapters are also available for long hole boring (both forward and inverted).

Let us send you folder B-341 which gives more detailed information about this distinctive tool

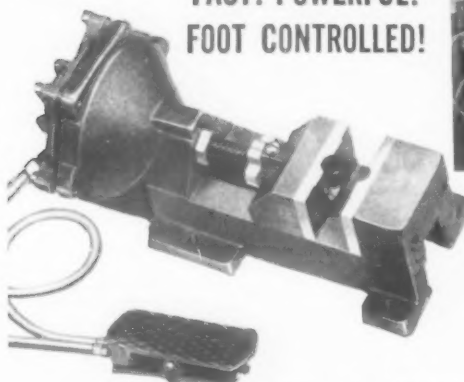


**BOKUM TOOL CO.**  
49 W. HANCOCK AVE DETROIT, MICH.

**SPEEDS PRODUCTION! CUTS TIME AND COSTS!**

## SPEEDY AIR VISE

**FAST! POWERFUL!  
FOOT CONTROLLED!**



**\$24**

Complete with  
Foot Control  
Valve, Air  
Hose and  
Fittings

**HAND FREE  
OPERATION!**  
• Foot operation  
leaves BOTH hands  
free for fast inser-  
tion and removal  
of work. Vise stays  
open or closed  
without constant  
foot pressure.

Most important vise design in years! A fast-action, hard gripping air vise that speeds production; saves time, labor and costs! Speedy Air Vise operates from air line or individual compressor, exerting a grip of 15 times air pressure! Jaw opening adjustable up to a maximum of 3 inches. Maximum travel of 1/2 inch assures rapid insertion and removal of work. Employs no piston, but instead a long-life, multiple-type diaphragm ... eliminating friction loss, air leakage and slippage. Rugged, compact, low priced, it is the ideal vise for speeding up numerous operations.

Write At Once For Circular E-9

**W. R. BROWN CORP., 5720 ARMITAGE AVE., CHICAGO, ILL.**

## Eliminates some Costly Tools

### CASE HISTORY Number 4.

The adapters are clamped on a "V" block which in turn is mounted on a rotating table on a milling machine. A slotting tool ground to the exact dimension specified is fastened to the clapper box tool holder. Each spline is cut in a few minutes — after rotating to a new position—the operation is repeated until all of the splines are cut accurately, dimensioned and equally spaced. Broaching — the only alternative — would have involved the expense of a series of broaches and broaching operations because the splines stop at the shoulder of the adapter. Use of the SLOTMASTER required no tooling expense and only one set-up.

Thumbnail illustrates set-up.



SLOTMASTER can be used on milling machines and provides double duty facilities at a minimum cost. It requires but little time to change-over from one head to the other ... The stroke of the ram is adjustable from 0 to 4" ... the speeds range from 50 to 250 s.p.m. ... The tool holder of the clapper box type, can be turned in any position ... All of the working parts are of tool steel heat treated and ground to close tolerances ... SLOTMASTER comes complete with pulleys, motor, belt, and mounting adaptable to round over-arm or flat-on round overarm milling machines.

Send for 4-page catalog and give the specifications of the milling machines that you wish to equip. Immediate deliveries on high priorities.

**EXPERIMENTAL TOOL & DIE COMPANY**

12601 Greiner  
Detroit,  
Michigan

Conventional  
set-up on round  
over-arm mill-  
ing machine.



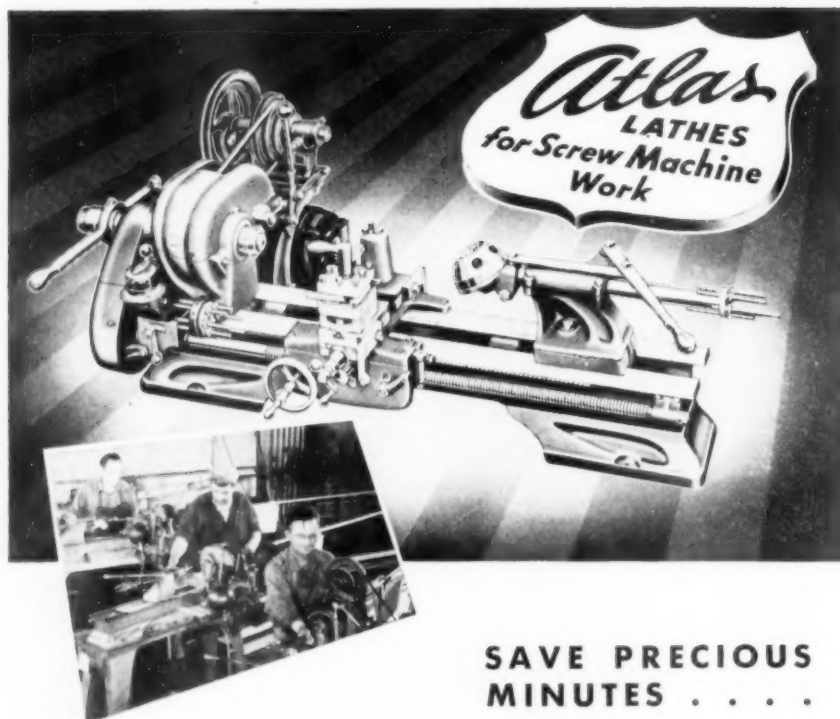
## PASSING PARADE

Los Angeles, California. **HOEFER** is said to have been responsible for many developments in die casting and pressure mold casting for his firm. At the same time, **JAMES F. McNAMARA** of the International Nickel Co., was elected chairman of the Board of Directors, and **STANLEY M. TRACY**, vice president of the Driver-Harris Co., was elected chairman of the Executive Committee. **COL. TEMPLE N. JOYCE**, nationally known aviation technical expert, was named vice president of the firm and chairman of the Advisory Committee.



### EX-CELL-O RECEIVES AWARD

Michigan's Governor Van Wagener congratulates Ex-Cell-O employees on winning nation's first U. S. Treasury "Bull's Eye" flag.



## SAVE PRECIOUS MINUTES . . . .

A battery of Atlas Lathes equipped for screw machine operations helps meet delivery schedules on a wide variety of precision airplane control units.

There is one sure way to by-pass the screw machine shortage on small parts production—use Atlas 10" Lathes with turrets and collet chuck. Equipment cost is low. Atlas Lathes have the rigidity and accuracy for today's precision tolerances and can take round-the-clock production runs month after month. We hope every manufacturer faced with shortages in screw machine and turning production will investigate the possibilities of Atlas Lathes. Atlas Press Company, 914 N. Pitcher St., Kalamazoo, Michigan.

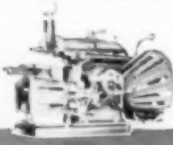


### OTHER ATLAS EQUIPMENT FOR WAR PRODUCTION



**MILLING MACHINES**  
Compact, powerful bench millers for full range of milling work.

**SHAPERS**  
Handle all work within a 2" stroke accurately, quickly.



**DRILLING MACHINES**  
Step-up production on small-hole drilling, tapping, 4, 3, 2-spindle models.



**EX-CELL-O CORPORATION**, Detroit, has been awarded the first war bond "Bull's-Eye" flag to be presented by the U. S. Treasury to any corporation in the country. The flag was presented by the U. S. Treasury to **PHIL HUBER**, president of the Corporation through **FRANK N. ISBEY**, state chairman of Michigan War Savings Committee, and **LIEUT. JACK A. SIMS**, of Kalamazoo, Michigan, one of General Doolittle's Navigators who bombed Tokio. This award was given to Ex-Cell-O for being the first firm to exceed (in war savings pay roll deduction campaign) 90% of employees and 10% of pay roll.

**RALPH W. TETZLAFF**, a former vice president of the Wittek Manufacturing Company, now serving as a lieutenant in the Army, was honored on his 28th birthday with a celebration in the form of a bond birthday dinner for executives and employees of the company held in Chicago.

**HARRY C. SATTERTHWAITE**, head of the Hole Engineering Company and a prominent tool engineer, has recently received word of the promotion of his son, **MAJ. PHILIP C. SATTERTHWAITE**, to the rank of lieutenant-colonel. Serving overseas with a regiment of engineers, **COL. SATTERTHWAITE** left Detroit as a captain in the 107th Engineers. He was superintendent of the Cogsdill Twist Drill Co. at the time of the mobilization.

**HERMAN W. STEINKRAUS**, formerly vice president and general manager of the Bridgeport Brass Co., of Bridgeport, Conn. has been elected president and general manager of the firm.

**WILLIAM J. EBERLEIN** has been named vice president in charge of sales of the Greenfield Tap and Die Corporation, Greenfield, Mass., in a recent change in the sales organization of this company.

*Get Paying Production*  
**With DEPENDABLE ENGINEERING**

**SIEWEK'S** STAFF OF EXPERIENCED  
 AND DEPENDABLE ENGINEERS IS READY TO  
 SOLVE YOUR ENGINEERING PROBLEMS . . .  
 TO HELP YOU ROLL NEW PRODUCTS INTO  
 PAYING PRODUCTION. EQUIPPED TO  
 HANDLE ANY ENGINEERING JOB, WE  
 DESIGN . . .

- **FIXTURES**
- **GAGES**
- **SPECIAL MACHINERY**
- **JIGS**
- **DIES**

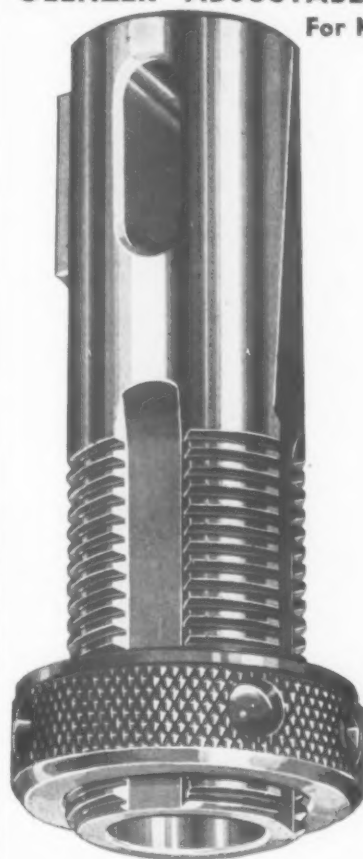
**SIEWEK**

**TOOL and ENGINEERING CO.**

209 PEARL ST.

HARTFORD, CONN.

**GLENZER ADJUSTABLE ADAPTERS**  
 For Multiple Spindles



STANDARD  
 EQUIPMENT  
 FOR ALL  
 DRILLING  
 REAMING  
 AND TAPPING  
 MACHINES.

ADOPTED AS  
 STANDARD  
 BY LEADING  
 AUTOMOTIVE  
 AND MACHINE  
 TOOL  
 MANUFACTURERS

*Utility  
 Tools*

THE  
**J. C. GLENZER  
 COMPANY**  
 6463-6477  
 Epworth Blvd.  
 DETROIT  
 MICHIGAN

**Maximum Tool Life**  
*plus Maximum Production*  
**— Use CROBALT!**

● A superior heat resisting chromium-cobalt-tungsten high speed cutting alloy. Permits higher speeds with longer tool life.

Eliminates the possibility of chipping.  
 Combines maximum production with  
 minimum cost per piece.

Catalog rushed on request . . .

Write Dept. D

**CROBALT INC.**  
 ANN ARBOR, MICHIGAN

**ROBALT**

**"ROCKWELL"  
 HARDNESS TESTER**



When we put our Trade Mark—  
 "ROCKWELL"—on a hardness test-  
 er, you are assured of its quality as to  
 both precision and durability.

380 Concord Ave.  
 New York, N. Y.

**WILSON**  
 MECHANICAL INSTRUMENT CO. INC.

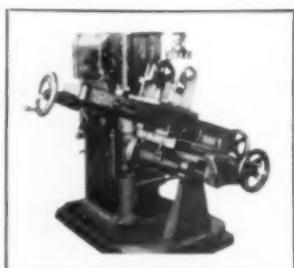
## PASSING PARADE

**NICHOLAS W. PRUMBAUM** received the highest award for the greatest number of years of service at a ceremony held at Pratt & Whitney, Division Niles-Bement-Pond Company at West Hartford, Connecticut. The company presented service buttons to 95 employees with service periods ranging from 10 to 50 years. The ceremony was held at noon in the plant, with presentations made by **E. J. O'MALLEY**, machine tool general superintendent, and **I. F. HOLLAND**, general superintendent of the small tool and gage department.



**PRATT & WHITNEY SERVICE AWARDS**  
**I. F. Holland** presents 50 year service button to **Nicholas W. Prumbaum**. **E. J. O'Malley**, left, and president **Clayton R. Burt**, right, watch the ceremony.

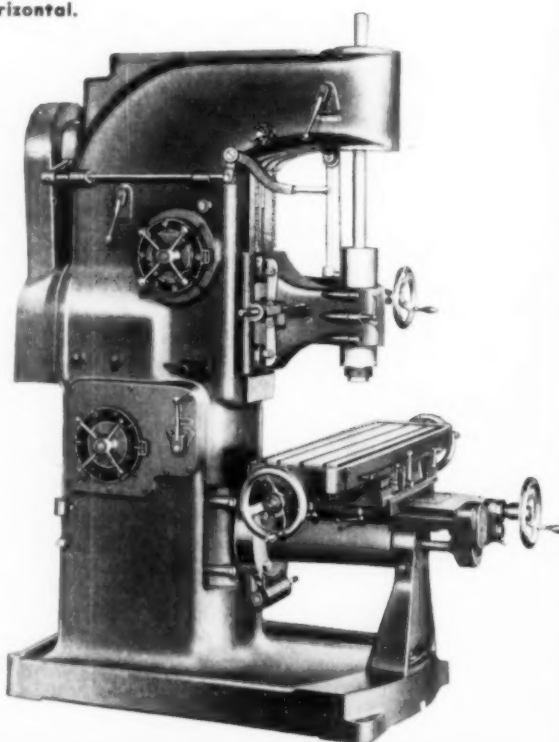
## Without Special Equipment-



Besides swiveling around the column, the table may be tilted to either side of horizontal.

**The Knight Miller Can Quickly and Accurately Machine Difficult and Unusual Parts . . . It Is Outstandingly Versatile!**

The unique table unit construction permits tilting it 35 degrees to either side of horizontal. Then by swiveling the table unit around the column, the longitudinal and throat capacity may be increased. Further versatility is found in the vertical adjustment of the spindle head and spindle, both of which are counterbalanced for easy handling. These features, used individually or simultaneously, effect many savings and broaden the scope of the miller.



**W. B. KNIGHT MACHINERY CO.**

3920 WEST PINE  
SAINT LOUIS, MO.

with **CLAYTON R. BURT**, president, presiding.

**LOUIS M. FULLER**, president of the American Abrasive Company, Westfield, Mass., has been named to the War Production Board corundum industry advisory committee.

**F. H. LINDUS**, who has been with The Timken Roller Bearing Company in Canton, Ohio for the past year, has been returned to the sales department of the company's service division and is now located in the San Francisco branch.

**R. EDSON EMERY**, president of the Jessop Steel Company, Washington, Pa., is celebrating his 42nd anniversary of service in the steel industry. He started in 1900 with the Crucible Steel Company, where he served in many capacities, and was general superintendent of all works in 1922, at which time, he left Crucible to become president of Superior Steel Co. Mr. Emery became vice president of the Colonial Steel Company in 1927 and since 1929 he has been president of Jessop.

**R. L. VANIMAN** of Detroit has been appointed chief of the Automotive Branch, WPB, it was announced recently. Mr. Vaniman succeeds **ERNEST KANZLER**, who was recently appointed deputy chairman for Program Progress of the War Production Board. Mr. Vaniman formerly was executive manager of the African Division of Chrysler Corporation, and since January 29 has been assistant chief of the Automotive Branch under Mr. Kanzler.

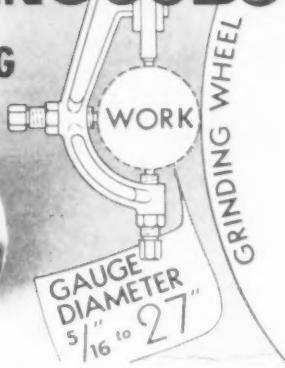
**COLONIAL BROACH COMPANY**, Detroit, will shortly occupy a new plant in Detroit, designed to more than double its broach manufacturing capacity. The new plant is in addition to increased facilities for the manufacture of broach-

## Speed Up GRINDING JOBS

With Automatic  
DIAMETER INSPECTING

### GAUGE

VISUAL  
READING  
DURING  
GRINDING



GAUGE  
DIAMETER  
5/16" to 27"

Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

Send for Bulletin

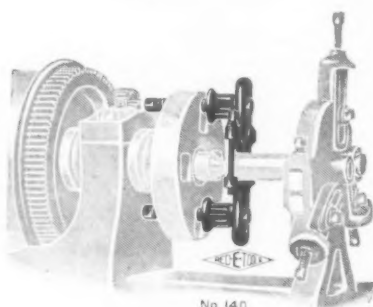
## American

**DIAMOND TOOL & GAUGE CO.**  
15926 WOODINGHAM • DETROIT, MICH.

TRY THIS

## MODERN WAY

of holding work to face plate when  
using the steady rest on a lathe...



No. 140

## RED-E FACE PLATE DOGS

Replace other old methods of holding as by belt lacing or hook bolt. The one shown consists of an adjustable dog or driver and two bolts passing through the face plate. Draws equally.

Write for Catalog E-42

**THE READY TOOL COMPANY**  
585 IRANISTAN AVE.

BRIDGEPORT

CONN.

## UNIVERSAL FLOATING CHUCKS FOR HORIZONTAL OPERATION



For use where piloting  
from the lead hole is  
required.

Designed for horizontal operation in automatic screw machines and turret lathes, Universal Floating Chucks are ideal for drilling, counterboring and reaming. Adjustable spring pressure compensates for tool weight thus preventing scored holes. Write for complete facts and prices.

**UNIVERSAL ENGINEERING CO.**  
FRANKENMUTH • MICHIGAN

## Use SCHAUER SPEED LATHES

for

•  
•  
•

## SECONDARY FINISHING



Release bigger and more expensive machinery from this type of work... and increase your production. Burnishing, polishing, lapping and burring operations of small machined parts are performed more efficiently with SCHAUER Speed Lathes. For further information write for Catalog No. 420.

"the originators of today's Speed Lathes"

**SCHAUER MACHINE COMPANY**

2066 READING ROAD

CINCINNATI, OHIO

ing machines which were provided by the erection of its No. 2 plant in the same locality about a year ago.

**THE ALLEGHENY LUDLUM STEEL CORPORATION** was the first company of more than 10,000 employees with headquarters in the Pittsburgh district to pass the 90% participation mark in the purchase of War Bonds under the Employees Payroll Allotment Plan.

**THE GEORGE KELLER MACHINERY COMPANY**, Buffalo, N. Y. has been appointed as representative of the Blanchard Machine Company in the Buffalo and Rochester territory.

**THE GREENFIELD TAP & DIE CORPORATION**, Greenfield, Mass., received the Army-Navy E award for excellence in production at ceremonies held at the plant on the afternoon of August 19. The banner was presented to Donald G. Millar, president of the company.

**THE C. H. BRIGGS MACHINE TOOL COMPANY**, Onandaga Hotel Building, Syracuse, N. Y. has been appointed as representative of the Blanchard Machine Company in Syracuse.

**ALAX DISTRIBUTING CO., LIMITED** are resuming operations in Canada of the Jessop Steel Company, Limited,

for direct mill and Toronto warehouse shipments.

**SEABOARD ENGINEERING COMPANY** announces the opening of an office at 29 Church St., Paterson, N. J., to do general industrial engineering, specializing on tool and machine design, and the laying out of process operation sheets, from rough castings, forgings or bar stock to the finished article. The office is under the management of Mr. G. J. Zurcher, vice-president and general manager.

**HARRY L. WISE** has just been appointed as president and general manager of Hydraulic Machinery, Inc., Detroit.

**FRANK J. HILL** has been elected vice-president of Greene, Tweed & Company, New York City, manufacturers of Palmetto and other mechanical packings and special tools. **MR. HILL** has been connected with the company since 1915.

**JAMES M. HIGHLAND** has been appointed sales engineer in the Pacific Coast area for the American Screw Company of Providence, R. I.

**NEVIN WATT** has been appointed general sales manager of The Baldwin Locomotive Works. **MR. WATT** will have general supervision over all sales of the Locomotive and Ordnance division and Standard Steel Works Division.

**CHARLES J. SPIEGEL**, General Electric installation engineer, retired July 31, after 43 years of continuous service with this company.

**WHEELCO INSTRUMENT CO.**, Chicago, announces three new South American sales outlets, Buenos Aires, Argentina; Santiago, Chile, and Montevideo, Uruguay.

**E. P. SAUNDERS, G. L. ATHERHOLT, SR., and C. M. SMILLIE, JR.**, of The Triangle Engineering Company, announce the establishment of their new offices at 400 E. Nine Mile Road, Detroit, Michigan.

#### Died

**GORDON STONER**, vice president and general manager of the Midland Steel Products Company died Tuesday, August 18th, at Ann Arbor, Michigan. A former professor of law at the University of Michigan, Mr. Stoner was born in 1880 near Valparaiso, Ind. He was a captain in World War I, and in 1918 became assistant to the vice president of the Detroit Pressed Steel Company. Made vice president of Midland Steel in 1926 and general manager in 1931. Mr. Stoner came to Midland Steel in



in plants all over the country — are Pioneer Pumps — furnishing proper flow of coolants to the whirling wheels of machinery — to make sure that fighting equipment for Uncle Sam is being produced under most efficient conditions.

Over 375 different pump models are represented — each one selected for its particular place because its design best fits the job at hand.

Pioneer Pumps are dependable.

**PIONEER ENGINEERING & MANUFACTURING CO.**

19645 JOHN R STREET • DETROIT, MICHIGAN



A NAME TO CHECK FOR POWER TRANSMISSION



#### MULTIPLE V-BELT DRIVES

The complete drive or component parts correctly designed. Sheaves up to 9 feet in diameter.

#### PULLEYS AND FLYWHEELS

All types made from our stock patterns. Diameters up to 12 feet—any face width.

#### GEARS AND SPROCKETS

Cut or cast from semi-steel or cast iron. Stock patterns used for cast types.

#### FOUNDRY WORK—OF COURSE

Tough jobs in cast iron or semi-steel are easy—46 years experience really counts.

PYOTT FOUNDRY AND MACHINE COMPANY  
328 NORTH WABAMON STREET CHICAGO

## Accurate Indexing At a Minimum cost

### with the HARTFORD Super-Spacer

Heavy cuts do not impair the accuracy of indexing of this SUPER-SPACER. The powerful clamp relieves the index plate and plunger of all strain by binding the turret solidly to the base. Indexing is extremely rapid and positive and the mask plates remove all possibility of error. Also, special holding fixtures may be mounted on the truly ground face of the chuck and located from the concentrically ground hole.

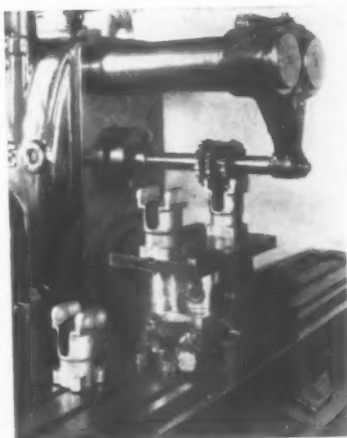


Illustration shows Hartford milling 3 surfaces in tough alloy castings. Operator loads one piece while another is being machined. Vertical feed used. Possibilities for similar applications are endless.

Write today for descriptive circular

THE HARTFORD SPECIAL MACHINERY CO.  
HARTFORD, CONN.

SEPTEMBER, 1942

## How to Speed Up Tapping and Reaming

THE Ziegler Tool Holder, by automatically compensating for spindle misalignment, greatly reduces set-up time — and also reduces spoilage losses due to oversize or bell-mouthed holes.

Takes any and all end thrusts. Always floats freely. No friction or cramping, even under the severest tool-driving-strains. No wonder it's the favorite in leading shops throughout the nation. Write for complete information.



W. M. ZIEGLER TOOL CO.

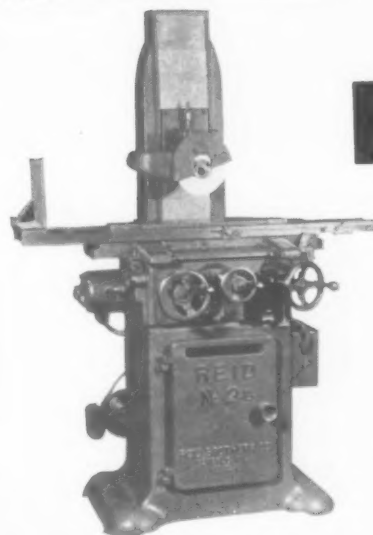
1920 Twelfth St.

Detroit, Mich.



Write for  
CATALOG

**FLOATING HOLDER**  
for Taps and Reamers...



THE

# REID

2B

**All Electric  
Automatic  
and Hand  
Feed Surface  
Grinder**

THE Reid All Electric Surface Grinder is equipped with a motorized spindle, thereby eliminating all belts, pulleys, and counterweights. Table and cross slide are equipped with oil rollers, insuring greater life and proper lubrication. Table is operated with a silent chain instead of rack and pinion gears. Grinding capacity 6 x 18 x 11. Additional height if required on all standard machines. Send to Dept. O for descriptive literature.

Exclusive Sales Agents

**H. LEACH MACHINERY CO.**  
387 Charles St., Providence, R. I.  
A Reid Distributor in Every Principal City

## "PRECISE" 35 GRINDER AND MILLER

*Electric!*  
35,000 LOAD RPM  
35 OUNCES  
1/7 H.P. FREE AT SPINDLE



*Speed Counts*

Now available in AC/DC 110 or 220 Volt. Direct drive, 100% shockproof, no vibration. Capable of 8 hours continuous run, without undue heating, for either hand or machine mounted operation.

Grinding on all materials with mounted wheels from 1/16" to 1" dia. x 1/2" face. Milling in nonferrous material with "PRECISE" Cutters up to 3/8" dia. x 1" face.

**PAUL F. HERMANN COMPANY**  
3400 FORBES ST. PITTSBURGH, PA.



**BETTER**  
Your  
**BORES**  
By  
**BEARINGIZING**  
**SECURE**  
**ULTRA-**  
**SURFACE**  
&  
**ACCURACY**

with  
**MINIMUM**  
**COST**

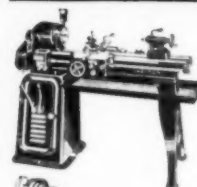
**INTERNAL,**  
**EXTERNAL**  
**& CONTOURS**

SEND DRAWING FOR  
RECOMMENDATIONS

**HOLE ENGINEERING SERVICE**  
5901 FOURTH AVE. DETROIT, MICH.

206

## SHELDON Back Geared Screw Cutting PRECISION LATHES

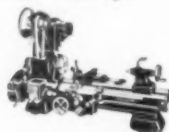


A full line moderate priced 10", 11" and 12" Precision Tool Room Lathes built to industrial quality tool standards. (Illustrated with Sheldon 4-speed lever operated under drive.)

Production Lathes with lever operated collets, lever cross slides and tailstocks. Ideal for second operation work — sturdily built precision tools.

Machine Shop and maintenance department lathes, with a wide choice of attachments, accessories and drives.

Better Bench Lathes with Bronze, Ultra-Precision Pre-loaded Ball or Super-Precision Roller Bearings.



Just out "The Care and Operation of a Lathe" to help apprentice training. 50c list price, discounts for quantity purchases.

**SHELDON MACHINE CO. INC.**  
4252 N. Knox Ave. Chicago, U.S.A.

## PASSING PARADE

1923 to serve as the secretary of that company.

**WILLIAM G. HEPBURN**, vice president and sales manager for The Cutter Wood & Sanderson Company of Cambridge, Mass., passed away very suddenly at his home in Portland, Maine. Mr. Hepburn was a member of the Boston Chapter of the American Society of Tool Engineers.

**WILLIAM PETERSON**, 55, associated with The Kelly Reamer Company for 30 years and Detroit representative for that company since 1924 died in Detroit July 24th. Mr. Peterson was a charter member of the Detroit Chapter of the American Society of Tool Engineers.

**OTTO C. BOZENHARD**, 57, maintenance supervisor at the American Bosch Corp., Springfield, Mass., for the past 31 years died recently.

## WASHINGTON LETTER

(Continued from page 144)

Recovery Corporation.

Plan is to inventory holders of steel, with materials usable "as is" to be directed to users, while non-usable materials will be scrapped.

August 7—WPB issues Limitation Order L-163 placing distribution of turbo-blowers under strict control. Manufacturers and dealers required to report orders on hand August 7. Units scheduled for delivery on or before August 31 may be completed, with the likelihood that other orders for less essential uses may be allocated to more important industry functions.

August 8—Order M-110 revised, providing that molybdenum may be melted only after approval of melting schedules as provided in Order M-21-a, or by specific authorization.

August 10—WPB notified machine tool producers that urgency standings are not applicable to a Preference Rating Certificate PD-1A. This rating can be applied to purchase from the 25 percent pool of tools reserved for domestic and foreign rated orders.

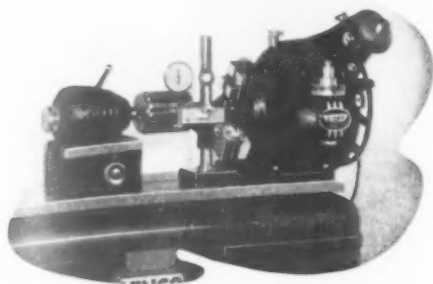
August 11—Priorities Regulation No. 12 revised. General policy will be to reserve AA-1 and AA-2 for military, although some use on emergency civilian requirements may be granted. AA-2X will be top civilian emergency rating. AA-3 and AA-4 will be mostly reserved for military.

August 13—Preference Order E-1-b amended for the reallocation of tools after certain quotas have been filled. Tools not purchased by one branch of

**THE TOOL ENGINEER**

## PRECISION

That Guarantees Accuracy  
of  
FIVE  
SECONDS  
Accumulative  
Error  
IN 360  
DEGREES

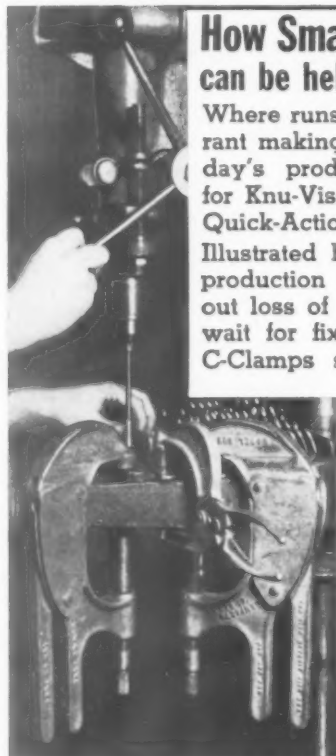


• The Vinco Optical Master Inspection Dividing Head is an instrument typical of the precision of all Vinco Products. Its principal use is for final checking of spacing, angular locations or similar characteristics of gear teeth, master index plates, splines, etc. In conjunction with the Vinco Cam Comparator, the Dividing Head can be used for checking the angular relation and amount of rise and fall of cams on automotive or aviation camshafts or on aviation cam discs.

Vinco inspection instruments and Vinco gages are in use today for checking thousands of the most accurate armament parts. They can be of immeasurable aid in maintaining the high precision required in your present War Production operations.

**VINCO**  
Corporation

9115 SCHAEFER HIGHWAY  
DETROIT, MICHIGAN, U.S.A.



### How Small Quantity Runs can be held without fixtures

Where runs are too small to warrant making jigs and fixtures, today's production demands are for Knu-Vise Toggle Clamps and Quick-Action Pliers.

Illustrated here is a case where production was carried on without loss of time; no necessity to wait for fixtures. The two large C-Clamps served as temporary

fixtures while the large throated pliers held the work in place during drilling operations.

C-Clamps are available in 5", 6", and 10" sizes, and lend themselves to a range of 15 to 20 different setups. The pliers have 3", 4", and 6" throats.

Let us help you with your  
clamping problems

**KNU-VISE**  
INCORPORATED

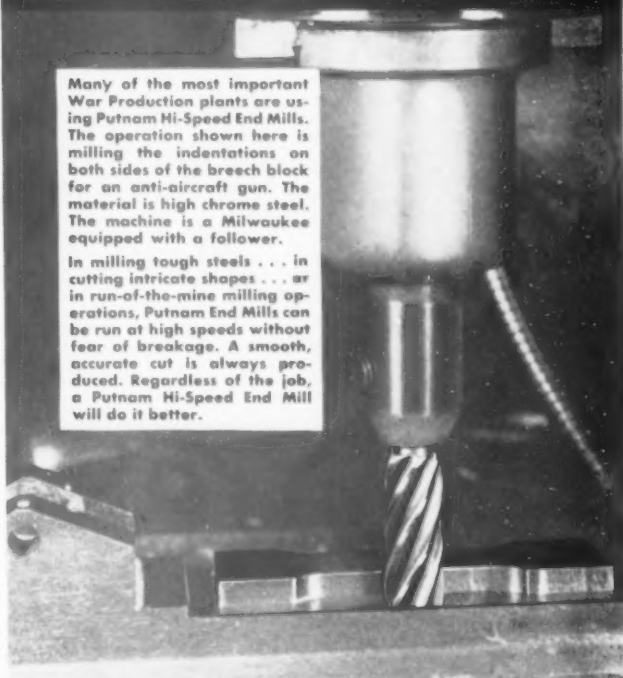
2204 - 8TH STREET  
DETROIT, MICH.

4328 San Fernando Rd., Glendale, Calif.

## ANOTHER PUTNAM END MILL Speeding War Production

Many of the most important War Production plants are using Putnam Hi-Speed End Mills. The operation shown here is milling the indentations on both sides of the breech block for an anti-aircraft gun. The material is high chrome steel. The machine is a Milwaukee equipped with a follower.

In milling tough steels . . . in cutting intricate shapes . . . or in run-of-the-mine milling operations, Putnam End Mills can be run at high speeds without fear of breakage. A smooth, accurate cut is always produced. Regardless of the job, a Putnam Hi-Speed End Mill will do it better.



### PUTNAM TOOL COMPANY

2987 Charlevoix Ave. • Detroit, Michigan

## Prevent rejects BEFORE they happen—with COMTORPLUG

This automatic 2-point  
contact gage checks  
bores to fractions of  
.0001"

### COMTORPLUG

Patented  
Expanding  
Internal  
Gage



Sizes:  
1/4" to 7" dia.  
and larger

Rejects are caused AT THE MACHINE. Too often the fault lies, not in the machine or operator, but in the limit gage system. Limit gages, even in the most expert hands cannot accurately divulge out-of-round, front or back taper, barrel shape, bell mouth, etc. But Comtorplug, even in the most inexpert hands, can instantly detect such irregularities, and thus enable the operator to adjust his machine BEFORE rejects occur. Equip BOTH operators and inspectors with Comtorplug, the ever-increasing favorite in airplane, ordnance, automotive, electrical and other industries.

Request Bulletin 27

### The COMTOR Co.

70 Rumford Ave.  
WALTHAM, MASS.





**NOW**

**A POWER DRILL  
FOR EVERY MAN**

Why use a sledge hammer to drive a tack — why use a \$10 drill to drill  $\frac{1}{4}$ " holes in wood or metal — why have workers share heavy tools, with attendant delays, when for the same investment each man can have his own SpeedWay No. 69 Electric Drill.

Designed in a new way to supplant heavy duty tools in light work these No. 69 $\frac{1}{4}$ " SpeedWay Drills are:

**Handier** — because lighter.  
**Faster** — have automatic chuck.  
**Cut-Cutting** — save costly man-hours, not price makes it thrifty to buy many.

**Dependable** — have specially wound, long life, air cooled SpeedWay Drill Motor.

**9<sup>95</sup>**  
No. 69 $\frac{1}{4}$ " Drill  
4 DRILLS for  
the price of 1.

Priority Orders on most SpeedWay Tools Shipped Immediately. Write for Catalog.  
**SPEEDWAY MFG. CO., 1894 So. 52nd Ave., Cicero, Illinois**

## IMMEDIATE DELIVERY

### AUTOMATICS

Brown & Sharpe No. 00 Cut-off  
Cleveland, 1 $\frac{1}{4}$  & 2" Model A  
Cleveland,  $\frac{7}{8}$ , 1-1/16, 1 $\frac{1}{2}$  & 2 $\frac{1}{2}$ " Model B  
Gridley, S.S. 2 $\frac{1}{4}$ , 3 $\frac{1}{4}$  and 4 $\frac{1}{4}$ "  
Nos. 22, 23 & 24 New Britain  
No. 5A & 6A Potter & Johnston

### GRINDERS

No. 6, 15 & 18 Bryant Internal  
10 x 36" Landis Hydraulic, M.D.  
2" x 8" Storm Piston  
Lapper, 26" Bethel-Player

### LATHES

Lodge & Shipley 16" & 8" M.D.  
Schumacher & Boye 18" x 8" cts shaft  
3" x 36" Jones & Lamson, Dblespdle

### MILLING MACHINES

No. 2 Kemfsmith Plain  
No. 1, 2 & 3 Craftsman Rotary  
No. 3 Lees-Brodner Thread

### PLANERS

Bedford, 39" x 13"—1 Rail & 1 Side Head  
Patch 36" x 13"—1 Rail & Side Head

### PRESSES

No. 34 Toledo Solid Back, Geared  
No. 2, 3, 4 Farracute Solid Back  
No. 778 Niagara Dble Crank

**MACHINE TOOLS POWER PRESSES**

**OTT  
MACHINERY  
SALES INC.**

**546 Second Ave. Detroit, Mich.**

208

the service are to be delivered to a buyer in a service group which has the largest backlog of unfilled orders for the particular type of tool released.

## SEPTEMBER MEETINGS

**DETROIT**—September 10, 6:30 P.M. Spanish Room of the Fort Shelby Hotel. The speaker will be Dr. Ralph L. Lee of the General Motors Corporation Public Relations Department. His subject will be, "Human Relations."

**FOND DU LAC**—September 11. This will be a technical meeting scheduled for Green Bay, Wisconsin.

**LOS ANGELES**—September 10. This meeting will celebrate the 3rd birthday of the Los Angeles Chapter.

**SPRINGFIELD, MASS.**—September 14, 6:30 P.M. Highland Hotel. Speaker of the evening will be Dr. Ralph Lee of the General Motors Corporation Public Relations Department who will speak on "Conversion from Peace Time to War Time". The coffee speaker will be Frank W. Curtis who will have "Induction Heating" as his topic.

**ROCKFORD** — September 10, 6:30 P.M. Dinner at the Hotel Faust. The speaker will be O. W. Winter, national president of the A.S.T.E. He will talk on his experiences and impressions in Russia. There will also be a colored movie on welding shown by the General Electric Company. Reservations: Allis Chalmers, Main: 6270, 610 Gas Electric Building.

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THE TOOL ENGINEER  
2842 W. Grand Blvd. Detroit, Mich.**

### SITUATIONS AVAILABLE

Tool Designer experienced in tool design on high pressure bronze and iron valves. Must be capable of laying out special design tools for rapid production machines. Address Box 745, The TOOL ENGINEER.

### WANTED

Experienced man to take full charge of a Tool, Cutter and Gage Shop. Box 472, The TOOL ENGINEER.

### FOR SALE

Distance Thermometer 100° to 212° F, 12 ft. lead, 2 inch round dial, radium hand and graduation, new, complete \$3.95. Revolution tachometer, 4 inch dial, aircraft type, accuracy within 20 revs, range 0-2400, RPM, brand new \$15.00. Air Transport Equipment, Inc., Garden City, N. Y.

## Introducing- VICTORY (Pat. Pending) DIAMOND TOOLS



and the

## VICTORY PROCESS

for Setting Industrial Diamonds

"VICTORY" diamonds are set in high carbon steel, stainless steel or Monel metal. Monel is generally used since it eliminates the possibility of soft oxides forming about the stone. This "VICTORY" process does not subject the diamond to harmful heat, pressure or shock. The entire process is as gentle as a baby's touch. The diamond remains sound and will not loosen or pull from the setting even in the most severe usage.

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15 West 46th Street, New York**

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EXCEPTIONAL OPPORTUNITY! Good salary... reasonable traveling expenses... attractive bonus on gross sales for six keen, aggressive men... age thirty-two to forty... thoroughly schooled and experienced in the Tool & Gage industry... engineering background very desirable, but not essential.

EXCEPTIONAL ORGANIZATION! Well established... with sound expansion program... building for present extreme needs, plus post war permanence... headed by one of Detroit's leading industrialists... a leader with a phenomenal success record of progress and achievement.

EXCEPTIONAL LINE! A superlative line of Gages, Tools and Fixtures... recognized and accepted by country's leading precision manufacturers... a line complete for direct sales representation.

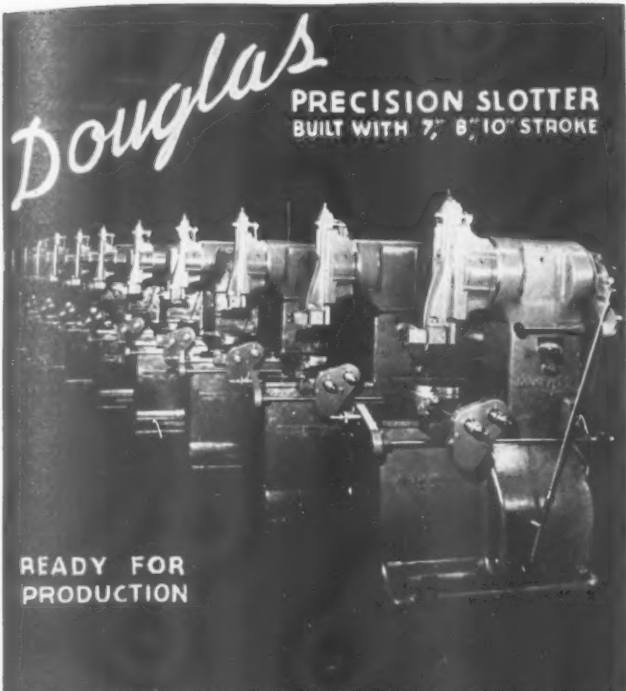
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CAUTION! All applicants will be considered only on their actual qualifications and background, so if your qualifications do not meet with those as outlined above, be considerate of your time and ours, please do not reply.

State in detail, experience, education, age, salaries earned, draft status, citizenship, address, telephone number and other pertinent information.

Reply Box 744, care of THE TOOL ENGINEER.

**THE TOOL ENGINEER**



**PRECISION SLOTTER**  
BUILT WITH 7", 8", 10" STROKE

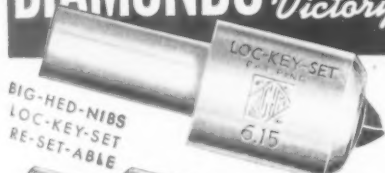
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SWIVELING RAM HEAD AND TOOL HOLDER, AUTOMATIC CIRCULAR TABLE AND INDEPENDENT AUTOMATIC FEEDS IN ALL DIRECTIONS

EARLY DELIVERY BY LARGE SCALE PRODUCTION

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**DIAMONDS for Victory**



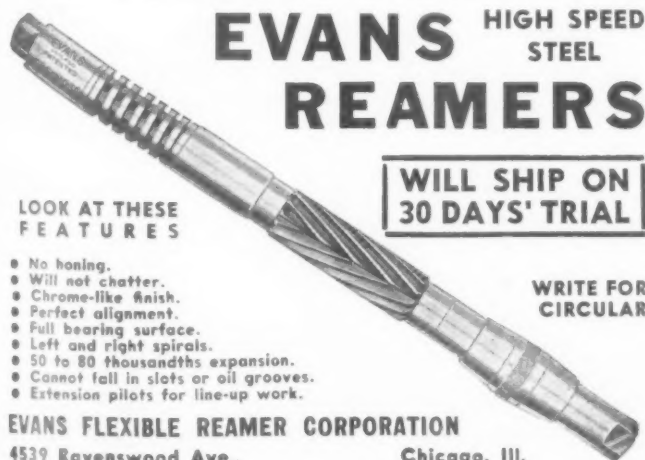
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Because: Wing key  
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Send specifications and prints for prices on turning and boring form tools.

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**WILL SHIP ON 30 DAYS' TRIAL**

LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

WRITE FOR CIRCULAR

**EVANS FLEXIBLE REAMER CORPORATION**  
4539 Ravenswood Ave., Chicago, Ill.

SEPTEMBER, 1942

**Here It Is, Mr. Inspector!**

**A PERFECT TRI-SQUARE GAGE**  
For Measuring 90° Angles



• Again, Jansson, "the House of Precision," announces an improved gage. The Master Tri-Square is the gage for laying out and checking right angle work, and square surfaces; the checking of V's, straight flat edges, and parallelism of cylindrical surfaces. No inspection room is complete without one!

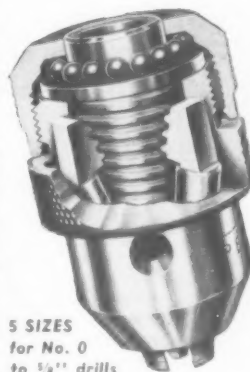
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Available in 2 sizes: 4" in height, 3/8" wide standing base; 6", 1" base. 1 piece construction hardened, ground, lapped from alloy tool steel with limits held to .00002" at 90° angle base and side. Inset serrated grip to prevent heat transference. Vertical side edge knife-sharp for truer visual gaging. Write, wire, or phone immediately.

**JANSSON GAGE COMPANY**  
19208 GLENDALE • DETROIT

**The "key" to higher drilling production is**

**Ettco-Emrick KEYLESS DRILL CHUCKS**



5 SIZES  
for No. 0  
to 5/8" drills

**FOR PORTABLE DRILLS**

Ettco - Emrick KEYLESS Drill Chucks are stocked to fit all makes of portable drills.

Key tightening of drill chucks is a non-productive operation that eats up valuable time and energy. And it's an unnecessary operation because you can get drill chucks that eliminate key tightening—Ettco-Emrick KEYLESS Drill Chucks — designed to let drilling action do the tightening. What's more, you get this important advantage in chucks as fine from every mechanical standpoint as any you can buy!

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586 Johnson Ave., Brooklyn, N. Y.  
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MAKERS OF **Ettco-Emrick** DRILL CHUCKS • TAP CHUCKS  
MULTIPLE TAPPING AND DRILLING HEADS  
TAPPING ATTACHMENTS • TAPPING MACHINES

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Ball and Roller Bearing  
**LIVE CENTERS**

# WILL NOT BURN OUT

the center . . . or the work

In your own plant—under your own production conditions—mount a MOTOR TOOL LIVE CENTER firmly against the work on your milling machine or lathe or grinder.

Start it spinning. Keep it going all day—all night—all week—all month. You'll find it won't heat up or burn out. Neither will the work, no matter what the material. Here's why.

Unlike dead centers, MOTOR TOOL LIVE CENTERS *revolve with the work* on both ball and roller bearings. In addition they are lubricated. FRICTION, the *cause* of burning out, is reduced to a negligible factor.

Aircraft, Army and Navy engineers, as well as those in private industry, have been quick to realize the greater economy of MOTOR TOOL LIVE CENTERS. With proper care they will last for a lifetime of continuous, care-free service.

### FEATURES

Simple Design . . . Heavy Duty . . .  
Greater Radial and Thrust Load Carrying Capacity . . . Large Spindle . . .  
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Locking Feature for Redressing Point without Disassembling . . . Oil Seal  
Lubricant Retainer . . . Compensation for Expansion of Metal.

# MOTOR TOOL MANUFACTURING CO.

## METAL CUTTING TOOLS

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*Make it a Rule  
to Call Motor Tool*

# MACKLIN

## GRINDING WHEELS



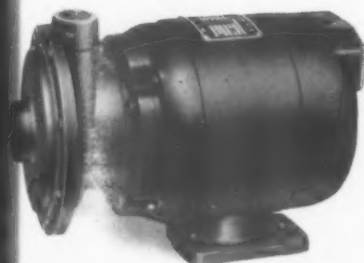
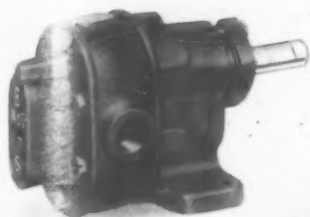
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Distributors in all principal cities

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# WHEREVER PRODUCTION DEPENDS ON PUMP RELIABILITY — Specify Brown & Sharpe



## ROTARY GEARED PUMPS

Spur Gear  
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Reversible  
For Hydraulic Operation  
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## CENTRIFUGAL PUMPS

Motor Driven  
Several styles for a wide  
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Also No. 8 Vane Pump for lubrication

Use dependable  
Brown & Sharpe Pumps

... for coolant — pressure —  
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combinations.

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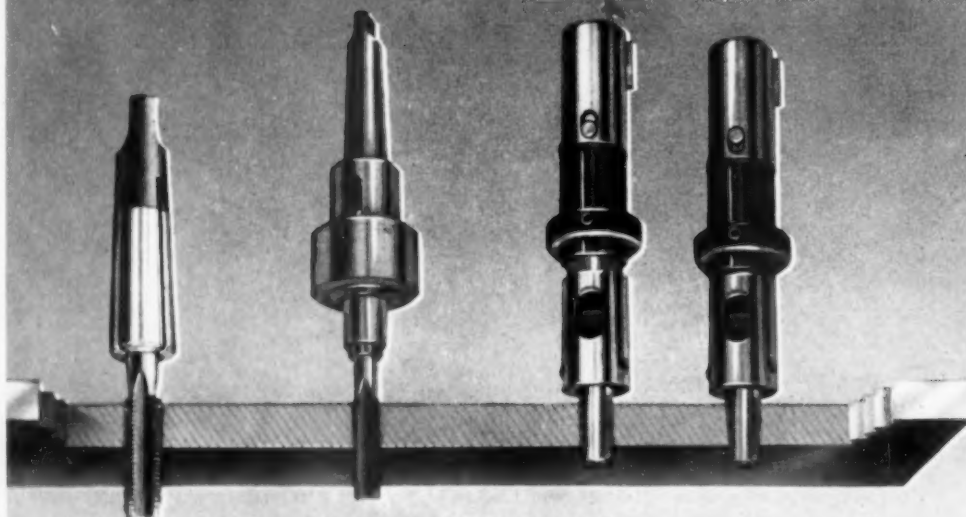
Brown & Sharpe Mfg. Co.  
Providence, R. I.  
U. S. A.

# BROWN & SHARPE

FOR *High Speed* PRODUCTION

# TAPPING

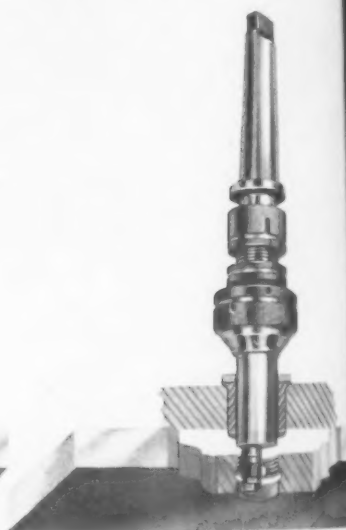
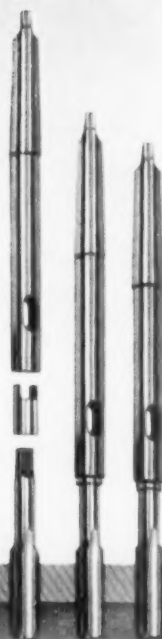
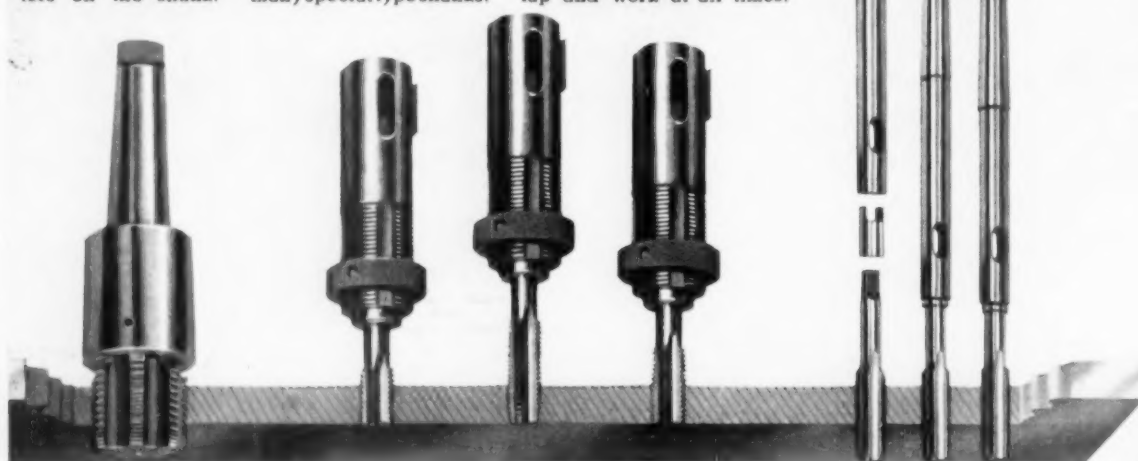
Style "G" Drill Chucks permit the use of straight shank jobber length drills in any spindle or holder with a Morse Taper hole.



Style "A" Tap Chuck is a one-piece tool having a Morse Taper shank which holds the tap with a collet action, drives it by the square and centers on the shank.

Ball Bearing Floating Holders compensate for misalignment of machine spindles or work. Furnished with optional Straight, Morse Taper, Adjustable Adapter and many special type shanks.

Tension or Compression Tap Holders when used in multiple spindle machines give more uniformity in the production of tapped parts. The spring action assures the correct contact between the tap and work at all times.



Heavy Duty Tap Holders for driving large size taps from 1/2" to 3" in diameter. The tap held in position with set screws while a broached square hole furnishes a positive drive. Morse Taper shanks unless otherwise specified.

Adjustable Adapter Assemblies provide uniform adjustment in multiple spindle drilling and tapping machines. This tool permits quick, accurate adjustment for the tap without disturbing the entire set-up. Furnished with Morse Taper, "Use-Em-Up" or Stub Taper holes. Crest-ground Acme threads or "V" threads.

Close Center Tap Drivers are designed for multiple tapping operations where tapped holes must be very close together or where a shoulder or other obstacle on the work prevents ordinary tapping. Drivers are furnished in three standard lengths and are smaller in diameter than the spindles in which used.

Recessing Tools, with interchangeable cutters, solve your problems in undercutting clearance grooves in tapped holes. Cutters covering a range of hole sizes from 1/2" to 1 3/4" diameter may be used in one tool body thus reducing your production tooling costs. Shank styles optional making these tools adaptable to all makes of machines.

## SCULLY-JONES AND COMPANY

1901 SO. ROCKWELL ST., CHICAGO, ILLINOIS

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